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STOWEX 96 REPORT

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The Synthetic Theater of War Architecture (STOW-A) is an evolutionary application of the Distributed Interactive Simulation (DIS) technologies. It is defined as a suite of hardware and software used to link live, virtual, and constructive legacy simulations, which will support prototyping for the future, study and testing of concepts and equipment, mission rehearsal, and training. This program is designed to reuse core components and products for rapid, cost effective implementations which maximize interoperability among simulations.

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1.0 Introduction

The Synthetic Theater of War Architecture (STOW-A) is an evolutionary application of the Distributed Interactive Simulation (DIS) technologies. It is defined as a suite of hardware and software used to link live, virtual, and constructive legacy simulations, which will support prototyping for the future, study and testing of concepts and equipment, mission rehearsal, and training. This program is designed to reuse core components and products for rapid, cost-effective implementations which maximize interoperability among simulations.

In 1994, the Synthetic Theater of War - Europe (STOW-E) demonstration provided the first step toward realizing the goal of a global, interactive simulation capability to support the Army's training and testing needs. During the development of this demonstration, a number of key technologies required to support large and complex scenarios were identified: scal~~ab~~ability, network interfaces and translators, computer generated forces (CGF), and virtual-constructive interfaces.

STOW-A is intended to provide the capability to support unit interactive training, mission rehearsals and experiments at the Brigade level, as well as compatibility with future object-oriented Advanced Distributed Simulations (ADS), which will support joint exercises. The focus of STOW-A includes development efforts required to field a tested system with the capability to support training, mission rehearsals, and experiments within networked, DIS compatible legacy simulations.

As the STOW-A technology matures, the possibility of creating a confederation of models with constructive, virtual, and live components opens new avenues for training. This confederation can be used to provide vertical as well as horizontal training extending from the commanders and their staff to individual teams practicing collective tasks. As shown in Figure 1-1, the commander and his staff will interface with a constructive representation of the battlefield, while field units operating in manned simulators operate within the same battlefield in the virtual world, and field units in vehicles interface to the same battlefield in the live world.

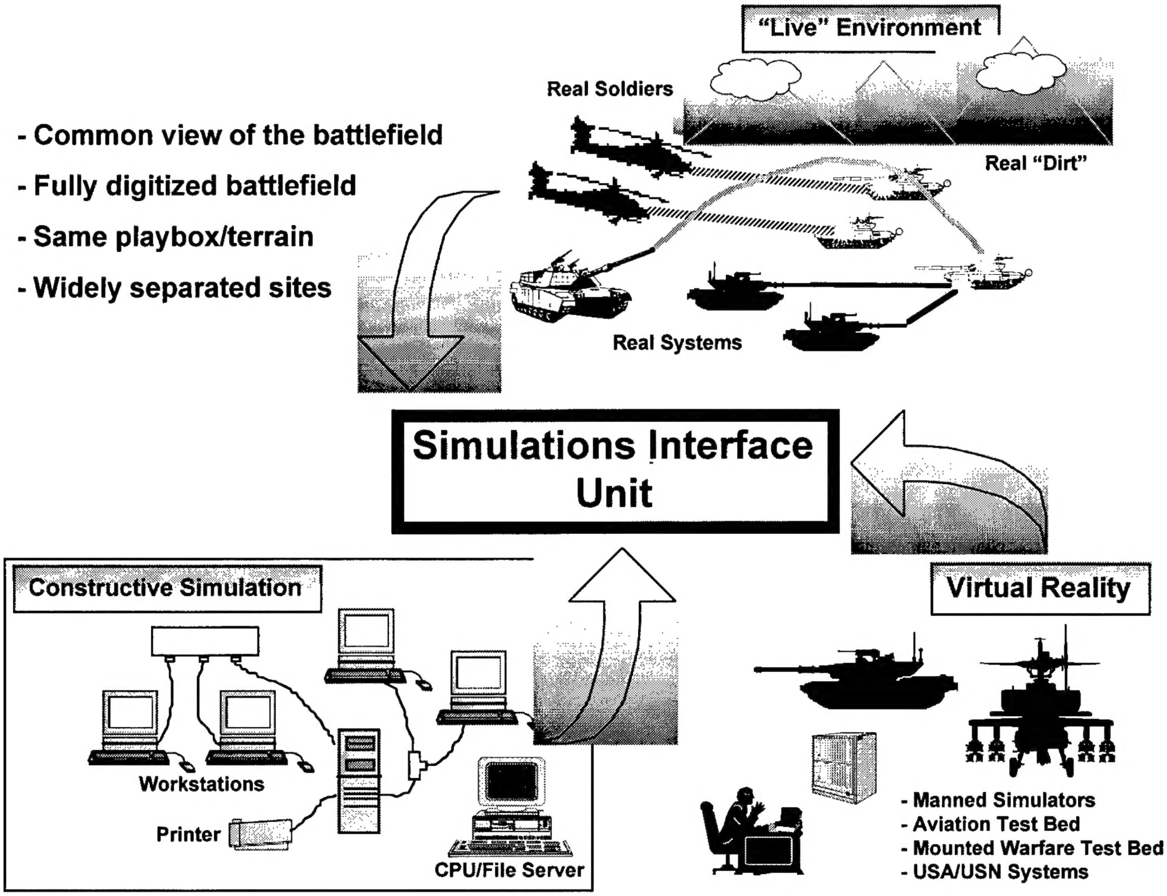


Figure 1-1 The STOW-A Concept

The STOW-A concept provides a DIS-based interface between constructive simulations and virtual simulators interacting on overlapping digital terrain databases. This interface has evolved through several exercises; it has been modified to take advantage of improvements in the Semi-Automated Forces (SAF) system representing the virtual side of the interface, restructured to open its architecture, enhanced to improve the translation of functionality between the two different types of simulation, and tested with increased rigor to establish stable performance. The STOW-A Exercise 1996 (STOWEX 96) baseline, STOW-A version 1.5, links the constructive Brigade/Battalion Battle Simulation (BBS) with the virtual world of manned simulators through an interface to the Modular Semi-Automated Forces (ModSAF). As shown in Figure 1-2, this interface consisted of BBS version 4.2, a translation function called the Opstate Interpreter (OPSIN), and a set of ModSAF processors (called the "Farm") that executes the movements of entities converted from aggregated BBS units to individual (disaggregated) virtual vehicles and representations of manned simulators.

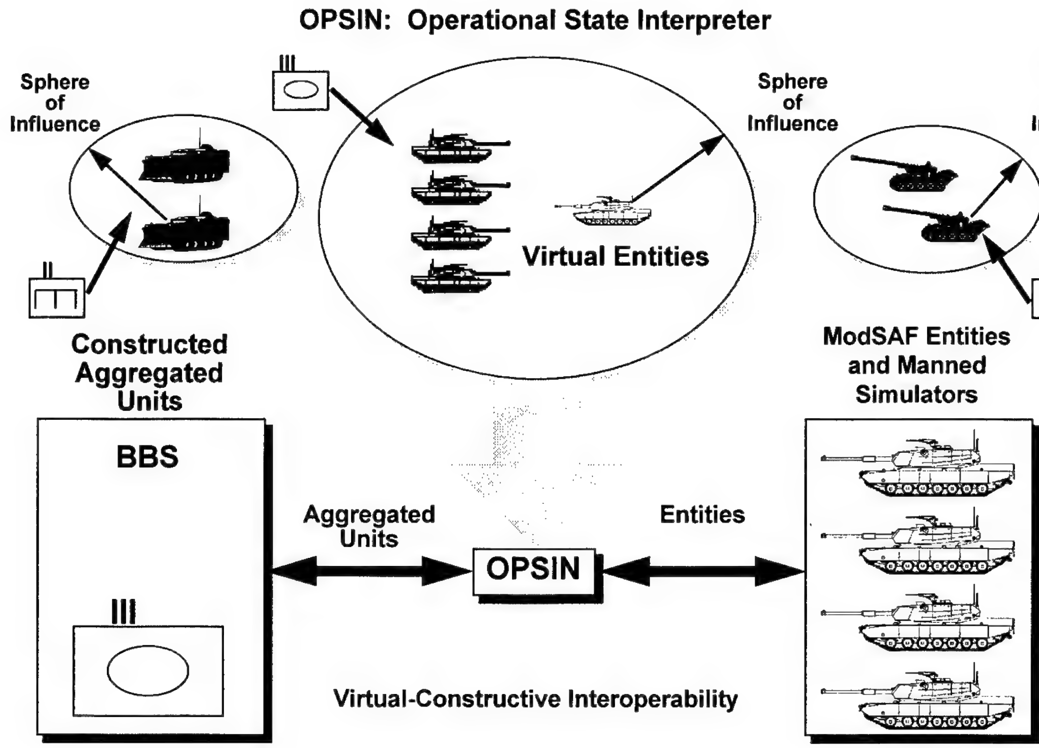


Figure 1-2 The STOW-A Constructive to Virtual Interface

1.1 STOWEX 96 Executive Summary

The purpose of STOWEX 96 was to support 1st Brigade Combat Team (1BCT) training utilizing the STOW-A hardware architecture and software version 1.5. The STOWEX 96 exercise was conducted 3 through 6 September 1996, with the objective to train the 1BCT in the same type of missions and OPTEMPO expected during a National Test Center (NTC) rotation. Equipment and personnel from the National Simulation Center (NSC) at Fort Leavenworth, the Fort Riley Battle Simulation Center (BSC), the Mounted Warfare Test Bed (MWTB) and the Mounted Warfare Simulation Training Center (MWSTC) at Fort Knox, and the Aviation Test Bed (AVTB) at Fort Rucker were utilized in support of the training exercise.

The following STOWEX 96 objectives were achieved:

- Supported the training objectives of the 1st Infantry Division;

  —Achieved goal of 500+ local entities on the ModSAF Farm during Functional Test II and reached 406 local entities during exercise (area defense) (Reference Appendix G, Test Logs for additional test conditions and entity count information);

  —Provided a reliable, stable virtual simulation and interface in support of STOWEX 96;

- Populated STOWEX 96 sites with appropriate STOW-A hardware and software suites which provide a DIS environment for training;

  —Installed and integrated STOW-A suite hardware and software which provided view-port / exercise control / After-Action Review capabilities at the BSC;

  —Installed and integrated STOW-A suite hardware and software which provided view-port capabilities at the Army Simulation Center (ASC);

  —Upgraded ModSAF Farm and OPSIN capabilities, installed and integrated stealth and Sound Storm capabilities in the technical control and visitor center, at the NSC;

  —Configured Observer Controller (OC) support SAFstations at the MWTB and the AVTB;

- Matured STOW-A technology;

  —Implemented and verified changes for problems identified during both Prairie Warrior 95 (PW95) and STOWEX 96 integration and test;

  —Integrated~~Played~~ the Low-cost Reconfigurable Simulators (ARSI, RCVS, and Dial-a-Tank) ~~during~~ into the STOW environment for the first time. LRS's were used in ~~exercise~~CS and CSS roles during the exercise ;

  —Upgraded the NSC STOW-A hardware to SGI R10000 machines and IRIX 6.2, providing increased capacity and stability;

- Provided a more realistic simulation for tactical communications with the use of the RT-31/TP-8 interface to the actual field radios;
- Generated and validated structured procedures for system startup, recovery and shutdown;
- Reduced the number of contract personnel required to support the exercise;
- Performed video teleconferences (VTCs) between Fort Knox and Fort Riley concurrently with the running of the exercise validating Defense Simulation Internet (DSI) "dual homing" capability.

1.2 Purpose

This final report for the STOWEX 96 Delivery Order will:

- Provide the information and guidelines required to conduct a STOW-A exercise,
- Identify issues and resolutions,
- Define the system baseline,
- Describe training objectives, and
- Describe the technical objectives.

1.3 Background

1.3.1 STOW-E

The principle of integrating constructive and virtual simulations was first demonstrated in the Advanced Research Projects Agency's (ARPA) STOW-E exercise in the fall of 1994. BBS provided the constructive component of this exercise. It was linked to the virtual world by means of the Simulation Network (SIMNET) predecessor of ModSAF. SIMNET simulators at Grafenwoehr provided the virtual simulation component of the exercise and the Combat Maneuver Training Center (CMTC) at Hohenfels provided the live component of the simulation. Additional simulations, including ModSAF, brought in Air Force and Navy components. All these components were linked together using the DIS protocols. This exercise proved that the concept of integrated constructive, virtual, and live simulations was technically possible.

The connection between BBS and the SIMNET SAF was accomplished by means of two modules. The interface to BBS was a program called Simulation Control (SIMCON). SIMCON was written in Ada, executed on the same computers as BBS, and monitored and modified BBS's data structures so that BBS could interact with externally simulated entities. The program that interfaced with the SAF was the Advanced Interface Unit (AUI) developed by the Navy Research and Development (NRaD) This program took inputs from SIMCON and translated them into commands for SIMNET SAF simulations. The AIU was written in C and ran on multiple single board computers.

While the STOW-E exercise proved that combined constructive, virtual, and live exercises were possible, there were a number of problems:

1. The technology was too immature to support training requirements.

2. The simulation was able to generate a peak of approximately 1000 entities, but it could not do so reliably for any reasonable length of time.

3. There was limited terrain reasoning or interaction with rivers due to the complexity of the new STOW-E terrain database, and dedicated development personnel were required to keep the system running.

1.3.2 Prairie Warrior

In the summer of 1994, ARPA and NRaD started a parallel effort to use ModSAF instead of SIMNET SAF, since the older system was rapidly becoming obsolete and did not support DIS, indirect fire weapons, distribution of simulation across multiple simulation hosts, resupply, or the increasing complexity of the terrain databases used for the simulation. ModSAF provided a more reliable and extensible virtual component at the cost of some initial functionality.

During the Prairie Warrior 95 effort, initial prototypes inherited from the ARPA SIMNET program were upgraded and enhanced, and new simulations were developed to allow models to interact on the DIS virtual battlefield. Enhancements were made in the ModSAF system, including the addition of limited functionality for Combat Support (CS) and Combat Service Support (CSS) ~~functions~~ for both BBS and SIMNET generated vehicles. In addition, the ModSAF system was upgraded to allow some entity migration from one workstation to another, resulting in a reduction of an earlier limitation involving the loss of entities due to system crashes.

During the integration and testing of the system, problems were found with many of the features supported by the new system. In some cases it was possible to fix these problems prior to the start of the exercise, but in others operational work-arounds had to be used. With the aid of these work-arounds, the exercise was run successfully, demonstrating that ModSAF could support constructive-virtual training. Significant achievements included operational terrain reasoning and obstacle avoidance supported on the Chorwon terrain database (more complicated than the STOW-E database) and the demonstration of fault tolerant operation during the exercise (a ModSAF simulation computer crashed without being noticed).

The following technical objectives were addressed and achieved:

- Correlation of behavior between entity-based simulation and aggregate-based simulation.
- Correlation of synthetic terrain between constructive and virtual worlds.
- Correlation of fidelity between constructive and virtual simulations.
- Support for "dual-fight" - allows one constructive unit to simultaneously engage a virtual entity, as well as another constructive unit.
- Passing Battle Damage Assessment (BDA) information between constructive and virtual worlds.

Key accomplishments of the Prairie Warrior 95 experiment included:

- Development of the BBS/OPSIN/ModSAF Constructive/Virtual interface;
- Enhancements of the Application Gateway (AG), Cell Interface Units (XCIU), and Translator Cell adapter Units (XCAU) for long haul networks;
- Enhancements of ModSAF to support additional entities, simulator placement, enhanced Rotary Wing Aircraft (RWA) behaviors, minefields, and the OPSIN;
- Integration of BBS, ModSAF, SIMNET M1s, SIMNET M2s, SIMNET RWAs, SIMNET Stealth, and the Simulation TRaining Integrated Performance Evaluation System (STRIPES) Stealth and After Action Review (AAR); and
- Wide area networking of five field sites.

After Prairie Warrior 95 was completed, a list of Trouble Reports (TR) was generated. In the months following the Prairie Warrior 95 exercise, the approved, prioritized set of the appropriate Trouble Reports was addressed. The OPSIN design was improved, CS/CSS enhancements of ModSAF 2.1 were addressed, and extensive testing was performed to improve stability.

1.3.3 STOWEX 96

The STOWEX 96 Delivery Order consists of five phases: Planning and Analysis, Exercise Design and Development, Integration and Test, Exercise Execution and Support, and STOWEX 1.6 Delivery. Preliminary planning encompassed systems engineering efforts to support the evolution of the STOWEX 96 training exercise. Exercise Design and Development provided on-going support for the development and implementation of the STOW-A 96 exercise. The Integration and Test Phase was performed in accordance with the Technical Support Plan. The Exercise Execution Phase supported the execution of the STOWEX 96 exercise from 3 through 6 September 1996. The final phase, which is in process, includes the development of the STOW-A 1.6 baseline. STOW-A 1.6 will incorporate corrections to deficiencies identified during the program and update the software baselines for specified STOW-A systems.

The STOWEX 96 effort defined an infrastructure consisting of those computers and equipment necessary to support the following functions:

1. The BBS - ModSAF Linkage,
2. After Action Review (STRIPES) and 2 dimensional (2D) and 3 dimensional (3D) display capabilities,
3. Sound system;
4. Plan View Display (PVD),
5. Network traffic filtering,
6. SIMNET-DIS translation,
7. wide area network communications,
8. and data logging.

These functions are required to interface BBS with ModSAF and manned simulators including SIMNET RWA simulators at the AVTB at Fort Rucker, AL, and SIMNET M1 and M2 simulators at the MWSTC and DIS Limited Reconfigurable Simulators in the MWTB at Fort Knox, KY.

Manned simulators were provided to and operated by the field units that had been transported to the AVTB and MWSTC/MWTB. Each of these field units operated the available manned simulators at their respective sites and used blue forces in ModSAF as "round-out" units to bring the virtual battallions up to TOE strengths. STOWEX 96 also

provided the equipment for a 3D and 2D stealth at Fort Riley and augmented existing equipment at the ASC to allow the ASC to serve as a STOW-A viewport.

1.4 Document Overview

~~This document provides an overview of the operational concept for the STOWEX 96 Exercise, a brief description of the technical components of the system, and a summary of the development and integration and test cycles as well as the execution of the STOWEX 96 exercise, including the issues and resolutions. This document consists of:~~ The STOWEX 96 Final Report provides a summary of the development, integration, functional test and execution of the STOWEX 96 exercise. An overview of the operational concept for the exercise is provided as well as brief descriptions of the technical components. Also included are the issues and resolutions for problems experienced during functional testing and the exercise. This document consists of:

- Section 1 provides pertinent background information of related STOW-A developments and exercises.
- Section 2 lists applicable documents.
- Section 3 identifies Government operational concepts.
- Section 4 presents a summary of the functions performed by each of the STOWEX 96 components as well as their software and hardware platform.
- Section 5 summarizes the activities performed on the ADST II STOWEX Delivery Order to date (through the 06 September Exercise and post-exercise activities).
- Section 6 presents the issues and recommendations that resulted from this period of performance.
- Appendices contain Government directives for the exercise, a site survey checklist, mapping data, a Communications Users Guide, shipping data, test procedures and test log, the Technical Control Plan, equipment disposition, a sample exercise control plan outline, and a sample of STOW-A requirements.

2.0 Applicable Documents

2.1 Government Documents

ADST II Statement of Work for Synthetic Theater of War Exercise 96 (STOWEX 96)	STRICOM, 25 April 1996
1st Infantry Division (M) Exercise Directive for 1st Bde Combat Team (1BCT) BBS (STOWEX) Command Post Exercise DEVIL WARRIOR 96-19.	3-6 September 1996

2.2 Contractor Documents

Standard for Information Technology, Protocols for Distributed Interactive Simulation Applications, Entity Information and Interaction, Version 1.2	IEEE 1278-1993
Standard for Distributed Interactive Simulation-Application Protocols (draft)	IEEE Std 1278.1-1995
Proposed IEEE Standard Draft for Information Technology, Protocols for Distributed Interactive Simulation Applications, Version 2.0, 3rd draft	IEEE 28 May 1993
Proposed IEEE Standard Draft for Information Technology, Protocols for Distributed Interactive Simulation Applications, Version 2.0, 4th draft	IEEE 16 March 1994
ADST II CDRL AB01 STOWEX 96 Report	Lockheed Martin, 5 July 1996, ADST-II-CDRL-013R-9600220
ADST II CDRL AB03 Technical Support Plan for STOWEX 96	Lockheed Martin, 3 June 1996, ADST-II-CDRL-013R-9600193
ADST II STOWEX 96 CDRL AB06 Application Gateway Version Description Document	Lockheed Martin, 7 October 1996, ADST-II-CDRL-103R-9600346
ADST II STOWEX 96 CDRL AB06 STOW-A ModSAF Version Description Document	Lockheed Martin, 7 October 1996, ADST-II-CDRL-013R-9600367
ADST II STOWEX 96 CDRL AB06 OPSIN Version Description Document	Lockheed Martin, 7 October 1996, ADST-II-CDRL-013R-9600347
ADST II STOWEX 96 CDRL AB06 SIMNET Simulator Version Description Document	Lockheed Martin, 7 October 1996, ADST-II-CDRL-013R-9600368

ADST II STOWEX 96 CDRL AB06 STRIPES Version Description Document	Lockheed Martin, 7 October 1996, ADST-II-CDRL-013R-9600344
ADST II STOWEX 96 CDRL AB06 XCIAU Version Description Document	Lockheed Martin, 7 October 1996, ADST-II-CDRL-013R-9600345

3.0 STOWEX Operational Concepts

The exercise intent and operational concept as extracted from the STOWEX 96 Coordination Message #8 dated 2 September 96 was as follows:

Intent. The purpose of STOWEX 96 is to support 1BCT training using STOW-A version 1.5. The means to conduct STOWEX 96 are equipment and personnel from the National Simulation Center, the Fort Riley Battle Simulation Center, The Mounted Warfare Test / Bed SIMNET Training Facility, and the Aviation Test Bed. The expected outcome is that the 1BCT is trained in the same type of missions and OPTEMPO anticipated during NTC Rotation 9705.

Concept of the Operation. No later than 0322100 SEP 96, STOWEX 96 will be conducted at Fort Riley, Fort Rucker, Fort Knox and Fort Leavenworth. The STOW environment will be used in the training of the 1BCT. Two task forces (TF) will be in BBS at Fort Riley, one TF will be in SIMNET / ModSAF at Fort Knox, the Attack Helicopter battalion will be in SIMNET / ModSAF at Fort Rucker. The BBS MicroVax farm (3100-95's), located at the Fort Leavenworth Technical Control, will be remoting via modems to the BBS workstations located at Fort Riley. The ModSAF farm, again located at the Fort Leavenworth provides capability to perform the disaggregated fight. ~~Two task forces (TF) will be in BBS at Fort Riley, one TF will be in SIMNET / ModSAF at Fort Knox, the Attack Helicopter battalion will be in SIMNET / ModSAF at Fort Rucker and Fort Leavenworth will host the BBS MV 3100-95 VAX Farm, remoting to Fort Riley [workstations], and the Silicon Graphics Incorporated (SGI) ModSAF Farm in support of the disaggregated fight.~~

3.1 Mission

The training mission as defined in the 12 July Exercise Directive was as follows:

1BCT conducts a brigade level BBS driven Command Post Exercise utilizing the COBRAS Training package 3-6 September 1996 at the Fort Riley BSC and Fort Rucker BSC in order to prepare for NTC rotation and support the STOWEX test.

1st Mission: Area Defense

2nd Mission: Movement to Contact

3.2 Training Objectives

The 1BCT Training Goals and Objectives by BOS as defined in the 12 July Exercise Directive were:

Command and Control

—Command Control the BCT
—Execute and improve BCT SOPs and Battle Drills
—Plan and develop orders effectively

Maneuver

—Defend
—Plan and execute a BCT R/S2 plan
—Perform a Passage of Lines
—Fight a Meeting Engagement
—Special emphasis on security operations to deny battlefield intelligence to the enemy
—Concentrate Combat Power effectively on the Battlefield

Fire Support

—Employ Fire Support
—Employ COLTs as an effective element of the BCT's deep fight
—Deliver timely and accurate Artillery Fires
—Plan and execute effective fire support plans in support of maneuver

Intelligence

—Plan effective reconnaissance and surveillance operations
—Prepare effective Intelligence products to assist the orders process

Mobility, Counter-Mobility and Survivability

—Effective engineer recon and reporting
—Mass engineers at the decisive points
—Effective and proper integration and synchronization of obstacles
—Positive control of Engineer equipment

Air Defense

—Use active and passive Air Defense measures
—Employ ADA scouts ICW with R/S2 requirements

Combat Service Support

—Resupply forward elements without disruption of combat operations
—Monitor and accurately track BDE operations

3.3 Operational Environment

For this exercise, five centers of activity were connected via the DSI network, as shown in Figure 3.3.1. Exercise Control and elements of the 1st Infantry Division were in Fort Riley, KS. The NSC at Fort Leavenworth, KS, served as the center for Technical Control. Manned simulators at the MWTB and MWSTC at Fort Knox, KY, and the AVTB at Fort Rucker, AL, participated in the exercise. In addition, a viewport at the Pentagon in Washington DC was provided. Fort Knox and Fort Rucker were connected to Fort Riley by VTC to support issuing orders and providing AARs. Two voice networks supported technical, administrative, and tactical coordination between sites. The following paragraphs discuss the specific configurations at each location.

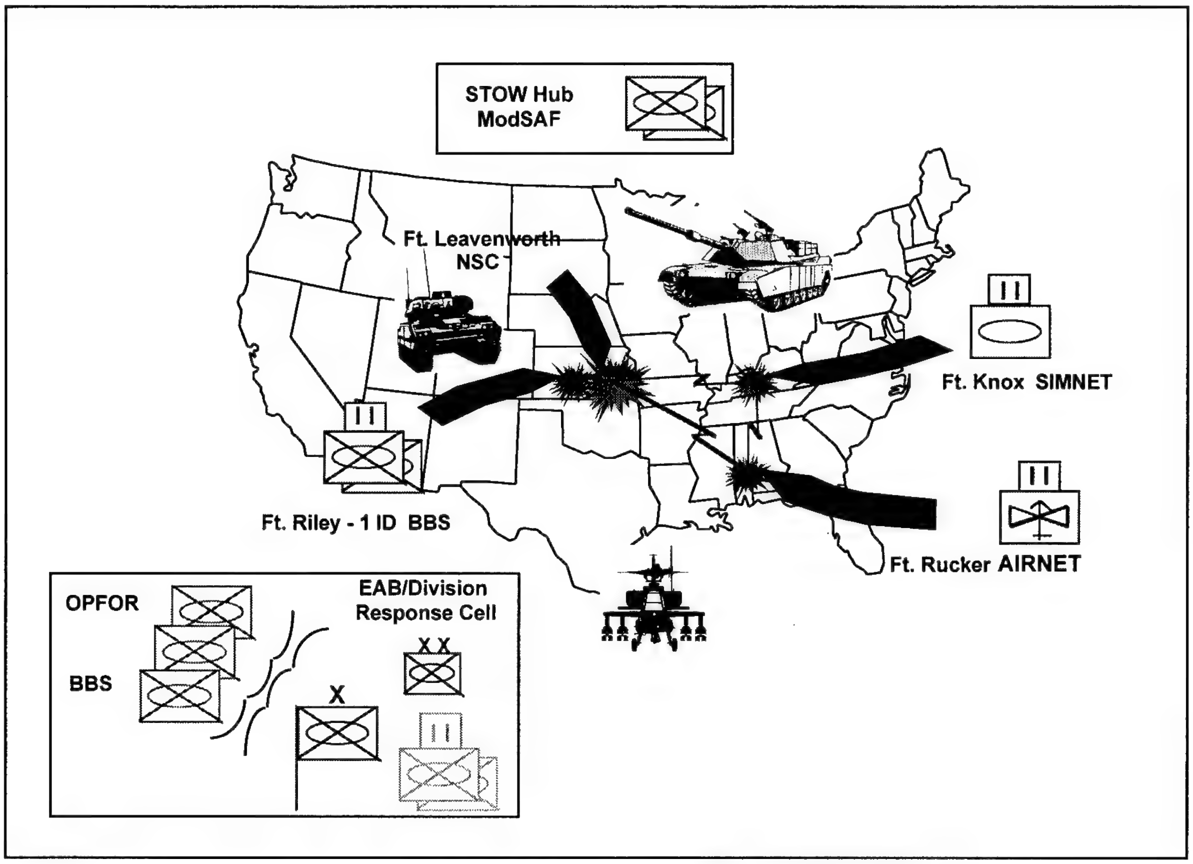


Figure 3.3-1 STOWEX 96 Playing Field

3.3.1 Exercise Control

Fort Riley served as the center for Exercise Control with BBS HICON and workstations that were linked, via commercial phone lines, to the BBS processors at NSC. The 1st Brigade, 1ID (Mechanized), located at Fort Riley, KS, was the focus of the STOWEX 96 training exercise. The 1ID BSC was the focal point of the training with components of the STOW-A required to control and fight the virtual and constructive simulated battlefield as described below. It also served as an observation site for visitors, utilizing a

multiple large-screen-format Stealth viewing system for concurrent and post-exercise viewing of the virtual battlefield. The Stealth and a Sound System were co-located with a BBS AAR station for monitoring and reviewing the BBS elements. There were no manned simulators at the Fort Riley node.

Figure 3.3.1-1 provides a physical layout of the Fort Riley BSC STOW-A facility, Building 8388. As shown, STOWEX 96 involved four primary areas of the BSC to support the training exercise: Exercise Control Area, the Blue Force BBS Area, the OPFOR Area, and the AAR Room.

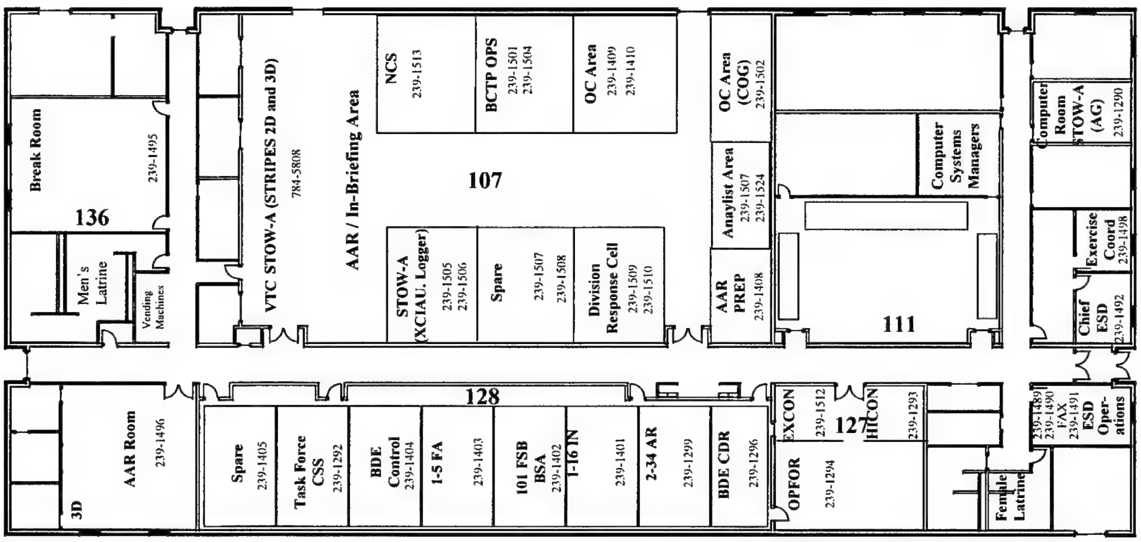


Figure 3.3.1-1 Fort Riley Facility

3.3.2 Technical Control

The NSC, located at the "Beehive" building at Fort Leavenworth, served as the hub site for the STOWEX 96 exercise, responsible for the Technical Control elements of STOW-A. The NSC also provided an observation site for visitors, utilizing a multiple large-screen-format stealth viewing system with sound for concurrent and post-exercise viewing of the virtual battlefield. A BBS "See All" station that reflected the BSC HICON supported monitoring and review of the BBS elements.

The hub site provided the primary computational assets such as the processors for BBS and the BBS-ModSAF linkage (OPSIN and Farm). The hub site also served as the center for Technical Control, responsible for the coordination of the interfaces to remote sites which included network filtering, master application gateway control, and technical oversight

NSC had the responsibility for monitoring the exercise to ensure that all of the elements responded in a technically correct manner. This was accomplished through the use of a ModSAF PVD and a BBS HICON.

Technical Control functions also included monitoring the performance of the OPSIN and the Farm during times of peak activity and providing manual work arounds, if required, to insure minimal interruption of the exercise.

The hub site also provided oversight of the WAN, determination of bandwidth limitations and resolution, implementing filtering schemes for all sites, and backup/recovery procedures for the WAN.

Figure 3.3.2-1 provides a physical layout of the NSC STOW-A facilities. Note that the BBS workstations were not used during the actual exercise and the HICON operated as a "See All" workstation.

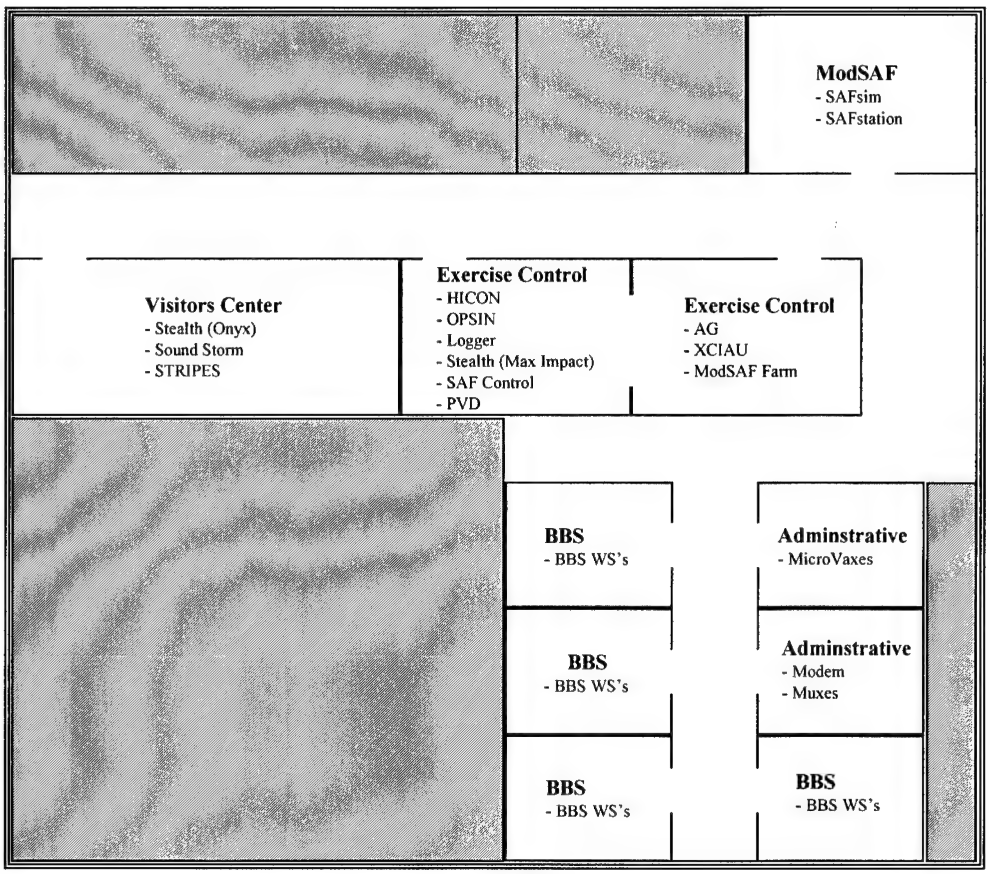


Figure 3.3.2-1 NSC STOW-A Facilities

3.3.3 Remote Sites

Fort Knox and Fort Rucker were remote sites that augmented the exercise with manned simulators. Fort Rucker provided eight SIMNET RWA simulators. Fort Knox provided up to forty-one SIMNET M1s and nine SIMNET M2s for the manned portion of Task Force 2-34. Fort Knox also provided CS/CSS training with the use of DIS Limited Reconfigurable Simulators. As indicated earlier, blue forces in ModSAF were used to

augment each site to round-out the manned simulators to bring each unit up to full strength.

A viewport facility located at the DCSOPS ASC in the Pentagon, Washington DC, was also included in the exercise.

3.4 Operational Scenario

The operational scenario is provided in Appendix A, STOWEX 96 Exercise Directive.

4.0 Technical Descriptions

The STOWEX concept interfaces constructive simulation provided by BBS with virtual simulation (ModSAF) and virtual simulators (manned SIMNET or DIS ground and air platforms). The basic STOWEX infrastructure consists of:

- Constructive simulation (BBS)
- The BBS-ModSAF Linkage (OPSIN, ModSAF Farm)
- Technical Control (SIMNET - DIS Translations, Network Traffic Filtering, Data Logging)
- DIS Stealth and AAR (STRIPES)
- Network Communications (Local, Wide Area, Application Gateway)

4.1 BBS

BBS is a constructive wargame developed for brigade and battalion commanders to train their battle staffs in combat and battlefield operations procedures. Combat activities simulated in BBS range from low- to high-intensity warfare. BBS is a two-sided, free-play simulation program set in a real-time environment. Brigade/Battalion commanders and their staffs exercise command post skills in the constructive simulation environment by responding to real-time combat situations. This simulation supports maneuver, fire support, air defense, engineering, Nuclear, Biological, Chemical (NBC), tactical air, air transport, Army aviation, logistics, maintenance, medical, personnel administration, higher headquarters functions, and threat operations.

The BBS platform is a set of Digital Equipment Corporation (DEC) MicroVAX 3100 computers connected by an Ethernet local area network. A BBS workstation, whose components are summarized in Figure 4.1-1, provides an operator with the ability to control units and subunits allocated during system initialization in accordance with the exercise task organization.

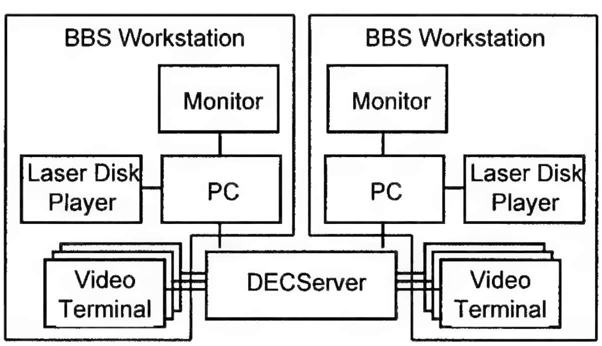


Figure 4.1-1 BBS Workstations

Each MicroVAX drives 2 workstations (graphics monitors to display map and equipment movement overlays, laser disk player, and personal computer). Sites that have older

VAX equipment (i.e., MicroVAX 3100-40s) must be upgraded to 3100-96s to support the addition of the interface to ModSAF.

4.2 ModSAF

ModSAF simulates a wide range of air and ground combat vehicles and personnel including tanks, infantry fighting vehicles, individual combatants, mortars and artillery, air defense systems, Armored Personnel Carrier (APCs), command posts and maintenance and supply vehicles, aviation elements, close air support, minefields and breaching equipment. Simulation of entities in ModSAF is divided into the behavioral and physical simulation. ModSAF physical models are built by combining model components such as hulls, turrets, weapons, and sensors.

A ModSAF PVD provides general technical control capabilities, such as:

- Map Scaling;
- Icon Identification: vehicle ID, bumper number, grid coordinates, vehicle type;
- Event Identification: artillery round, vehicle hitting a mine, direct fire, vehicle status, etc.;
- Terrain Features: UTM grid lines, water, roads, trees, buildings, power lines, pipelines, towns, political boundaries, and contour lines;
- Ability to view aggregated BBS units;
- Allow operator intervention.

Monitoring the exercise movement at the ModSAF PVD is performed to ensure that no inadvertent activity occurs. For example, a manned simulator that enters an area with aggregated BBS units can cause unexpected disaggregation at inappropriate times which may have adverse effects. Similarly, a constructive unit that is on the perimeter of a virtual unit's sphere of influence may undergo successive disaggregations and reaggregations that unnecessarily stress the system and require manual intervention to replace individual disaggregated entities.

4.3 BBS-ModSAF Linkage

The BBS-ModSAF linkage includes (1) mapping between BBS operational states and ModSAF tasks that represent different approaches to simulating common activities such as resupply, (2) rules for aggregation and disaggregation of constructive units that enables the interaction with ModSAF entities and the soldier-in-the-loop, and (3) support for disaggregated units in the virtual world (ModSAF Farm).

BBS is designed for training battalion and brigade staffs and does not simulate the exact location or direction of vehicles in a unit. As a consequence of not simulating the individual vehicles in a unit, BBS aggregates cannot directly interact with manned simulators. This capability is achieved through the BBS-ModSAF Linkage which utilizes two critical concepts:

- aggregation - a collection of individual elements into a unit, indicated by its military symbol, and,
- disaggregation - the disassembly of those units into individual entities, each shown as a single vehicle icon.

When a virtual entity comes within a certain distance (called the Sphere of Influence, or SOI) of an aggregated unit generated by BBS. The OPSIN senses the virtual entity position, disaggregating the BBS unit by directing ModSAF to create an appropriate series of ModSAF generated entities on the virtual battlefield. Orders to these ModSAF generated units are then controlled by the OPSIN in response to orders from the BBS side of the interface. Events on the virtual battlefield that impact the state of these BBS originated elements, such as disposition of virtual forces and combat outcomes, are communicated by the OPSIN back to BBS so that a coherent representation of forces can be maintained between the virtual and constructive simulations. Units that involve human operators, such as SIMNET simulators, are never aggregated, but are always represented as vehicles in BBS.

Work on the Legacy Application Adapt~~o~~er (LAA) is on-going to create aggregate units for ModSAF generated vehicles and manned simulators. The ModSAF operator selects vehicles from the PVD to create aggregates with the specified echelon level. Up to 25 vehicles or sub-aggregates can be identified for an aggregate. Aggregated units are then represented in the virtual world through the experimental Aggregate State PDU which contains the unit's center of mass, velocity, orientation, and formation. The ModSAF operator can also obtain information about a vehicle's aggregation status through the same user interface.

The BBS-ModSAF Linkage is comprised of BBS, OPSIN, a Farm (ModSAF SAFSims), and a ModSAF PVD. The ModSAF Farm consists of 6 to 10 back-end ModSAF computers that are responsible for generating the disaggregated entities associated with the constructive part of the simulation. The PVD provides an operator interface and shows a 2D view of the terrain and all of the constructive and virtual participants. For STOWEX 96, the Farm required 7 back-ends to achieve the desired number of virtual entities (400).

STOWEX 96 identified an upgrade of the Indigo2 processors used previously for the OPSIN, the Farm, and the Farm PVD. R4400s used during Prairie Warrior were replaced by the new R10000s. However, the Intel Ethernet card and SGI software driver that was used with the R4400 Indigo2 was not compatible with the IRIX 6.2 on the R10000 systems. In order to provide the dual Ethernet capability required by the OPSIN (to communicate with BBS and the DIS Ethernet), a new Ethernet card from Qualix was

identified, installed, and tested successfully. This card comes with a firmware driver. Table 4.3-1 summarizes the STOWEX 96 linkage configuration.

Table 4.3-1 BBS-ModSAF Linkage Configuration

Name	Quantity	Source/Vendor	Function	Configuration/Identification
MicroVAX	10	DEC	BBS	• CPU: 3100-95 • SW Version 4.2
Indigo2	1	SGI	OPSIN	• CPU: Indigo2 R10000, 2GB disk, 256MB RAM, IRIX 6.2 • Qualix Ethernet card • 20" color monitor and keyboard • OPSIN compiled for IRIX 6.2, version 1.9 dated 28 June 1996
Indigo2	7 plus 1 spare	SGI	Farm	• CPUs: Indigo2 R10000, 2GB disk, 128MB RAM, IRIX 6.2 • 20" color monitors and keyboards • ModSAF sw version 2.1 dated 28 June 1996, compiled for IRIX 5.3
Indigo2	1	SGI	PVD	• CPU: Indigo2 R10000, 2GB disk, 256MB RAM, IRIX 6.2 • 20" color monitor and keyboard • ModSAF sw version 2.1 dated 28 June 1996, compiled for IRIX 5.3

4.4 Technical Control

Technical Control is comprised of support equipment used by personnel to ensure that the exercise is proceeding without hardware or software problems. Technical Control components include the DIS translation and filtering programs (XCIAU and data logging devices). Table 4.4-1 provides the STOWEX 96 Technical Control components and purpose.

Table 4.4-1 Technical Control Components

Component	Purpose
XCIAU (XCIU)	Filter out ModSAF PO database information generated by the Farm; allow only DIS PDU traffic on the net
XCIAU (XCAU)	Translate between SIMNET (RWA, M1) and DIS PDUs; filter out ModSAF PO traffic
Logger	Record DIS PDUs

The XCIAU has combined the previous XCAU and XCIU functions onto a single processor. The translation function of the XCAU and/or the filtering function of the XCIU may be performed on a single workstation.

The XCAU provides a mechanism of translating between the older SIMNET PDUs and newer DIS PDUs. The function is bi-directional providing simultaneous DIS to SIMNET and SIMNET to DIS translations. The user interface for the unit is used to display on-line statistics and provide limited control over the conversion process.

Limitations on the amount of network traffic that individual pieces of hardware and the network itself can handle have created the need to provide local area network filtering. This capability is furnished by the XCIU which provides a gateway between two networks. The unit provides positive filtering, allowing only the network traffic that has been specifically identified, to pass to the next segment of the network. The XCIU was designed for SIMNET and DIS systems and can control which SIMNET and DIS PDUs will be passed through the system. The system can filter PDUs by PDU type, range or in the case of entity state PDUs by individual entity. One use of an XCIU is in a BBS/ModSAF system. The XCIU is placed after the OPSIN and BBS ModSAF engines to filter the Persistent Object Protocol packets from the rest of the network. Although the XCIUs are normally set up prior to the exercise and do not require any further attention, they can be used for troubleshooting network problems which may be attributed to an overloaded network.

Data Loggers are passive devices that record network traffic. This information can then be used to play back portions of a virtual simulation.

Table 4.4-2 summarizes the XCIAU and Data Logger equipment.

Table 4.4-2 Technical Control Equipment Summary

Name	Description	Location	Function
XCIAU-1	Indigo2 R4400, 128MB, 2.0GB System Disk, IRIX 5.3, Intel Ethernet card	Hub, remotes	Filter network traffic between local network and wide area network
XCIAU-2	Indigo2 R4400, 128MB, 2.0GB System Disk, IRIX 5.3, Intel Ethernet card	Hub	Filter PO traffic from ModSAF Farm to local area network
XCIAU-3	Indigo2 R4400, 128MB, 2.0GB System Disk, IRIX 5.3, Intel Ethernet card	Hub	Filter network traffic to AAR
XCIAU	Indigo2 R4400, 128MB, 2.0GB System Disk, IRIX 5.3, Intel Ethernet card	Remote with manned sim	Translate between SIMNET, DIS
XCIAU	Indigo2 R4400, 128MB, 2.0GB System Disk, IRIX 5.3, Intel Ethernet card	Remote	Filter network traffic between local network and wide area network
Logger	Indigo2 R4400, 128MB, 2.0GB System Disk, IRIX 5.3 Archive 150 MB, 1/4" tape drive Archive 4-8 GB, 4 MM, DAT Tape Drive 9 GB, SCSI disk drive Dual speed CD ROM drive	All	Log data for playback on STRIPES AAR

4.5 DIS Stealth and AAR

The 3D Stealth provides a "window into the virtual battlefield" which allows observers to make non-obtrusive observations of the action occurring within the virtual world. A

stealth system provides a three dimensional view of the battlefield similar to the out-the-window display of a simulator. Although the stealth can see other SIMNET and DIS entities, it is not able to be seen or affected by these entities. A stealth can be flown through the battlefield with a system mouse or spaceball, can be attached to another SIMNET/DIS vehicle or can be teleported directly to a specific location through the use a two dimension Plan View Display of the battlefield. Technical Control personnel rely on the stealth to help troubleshoot movement problems by identifying the source of the problem (no-go terrain, unfordable water or too steep of slope).

The Government Furnished Equipment (GFE) STRIPES software provides STOWEX 96 with a stealth and an AAR capability. STRIPES provides the following AAR functions:

- Collect data broadcast over the network (vehicle location, vehicle status, and firing events).
- Filter and organize the data to support rapid analysis
- Load data into a relational database (pattern after the National Training Center)
- Integrate broadcast data with unit planning and terrain data, and
- Provide graphic and tabular displays of data to support individual vehicle and unit performance feedback.

In addition, STRIPES provides the capability to display Experimental Aggregate State PDUs.

STRIPES may be hosted on either an SGI Deskside Onyx or a Maximum Impact Indigo2 with an Impact Channel Option (ICO). Both platforms have the capability to use multiple large screen displays. For STOWEX 96, three 37" Mitsubishi monitors were used for each STRIPES platform. At the NSC, one STRIPES system was hosted on an Onyx and one on a Maximum Impact to support both the Technical and Exercise Control rooms and the Visitor Center. At Fort Riley, STRIPES was hosted on a Maximum Impact. Since the ICO was not delivered in time for the Exercise, an adapter cable that interfaced the Maximum Impact with a single 37" monitor was used. A space ball served as the navigation device for the Onyx while a mouse was used for the Maximum Impact. A Sound Storm system, provided by Reality by Design on a Personal Computer, provided the audio for vehicle movements and collisions, and weapon systems detonations.

4.6 Network Communications

STOWEX 96 uses two types of data communications. Within each site, STOWEX components transmit and receive information over the local area networks. Wide area networks connect the NSC hub and remote sites.

4.6.1 Local Area Network

The main DIS Ethernet network is the mechanism through which all simulation applications ultimately interact with other applications in the system.

The hub site contains a BBS network and multiple DIS Ethernet networks. BBS uses an Ethernet network. This network connects to the ModSAF Farm subnet through the OPSIN SGI computer with dual Ethernet capability. OPSIN, the Farm, and the Farm PVD are on a DIS (10BaseT Ethernet) subnet that isolates the large volume of ModSAF PO traffic required for the Farm from the main DIS network and keeps unneeded PDUs from the ModSAF Farm off the main DIS net. This subnet is connected to the BBS network via the dual ported OPSIN and to the main DIS network through an XCIAU. The Technical Control stealth system is on a DIS subnet, and the Visitor Control AAR system is on another DIS subnet. As shown in Figure 4.6.1-1, XCIAUs filter data between DIS nets.

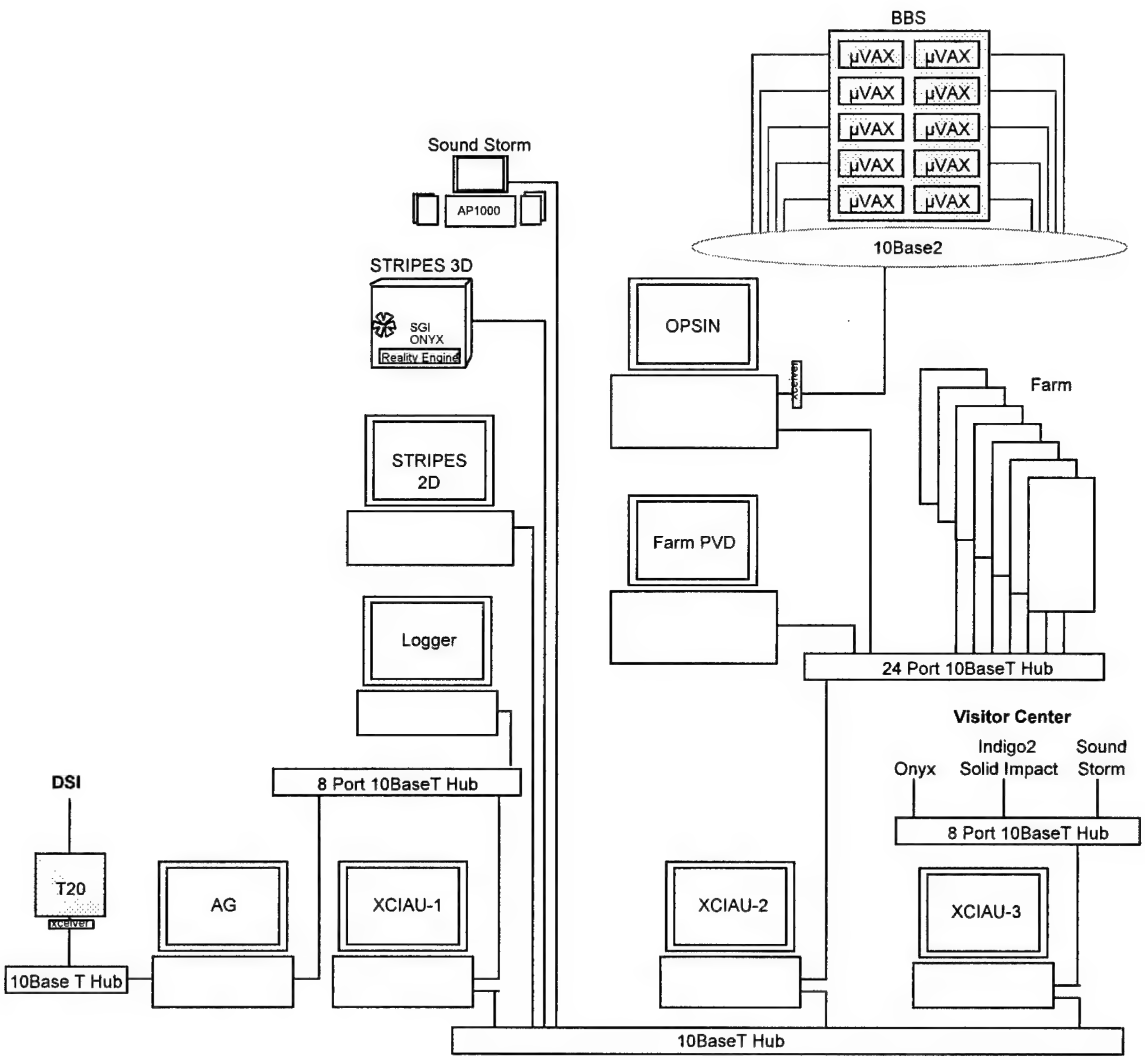


Figure 4.6.1-1 NSC Networks

A conceptual Fort Riley network is shown in Figure 4.6.1-2. There is no connectivity between the Fort Riley BBS Workstations and the STOW-A equipment.

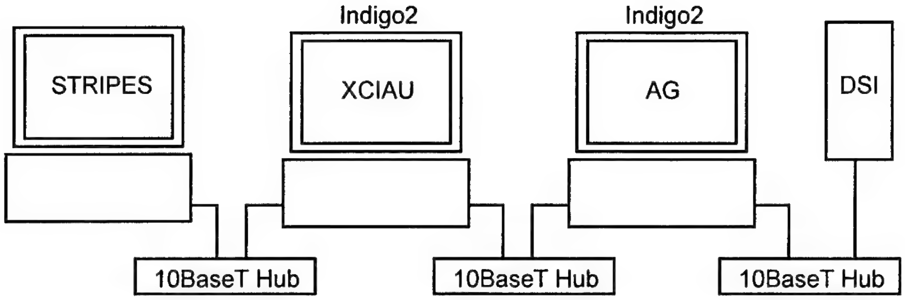


Figure 4.6.1-2 Fort Riley Network

Figure 4.6.1-3 provides a general drawing for the 10BaseT and Thicknet networks at AVTB and MWSTC. XCIAUs translate between SIMNET and DIS protocols. The LRS simulators in the MWTB extension are not portrayed. Previous LRS network configurations placed the LRS systems on separate 10BaseT subnets with XCIAUs dedicated to limit the number of incoming PDUs.

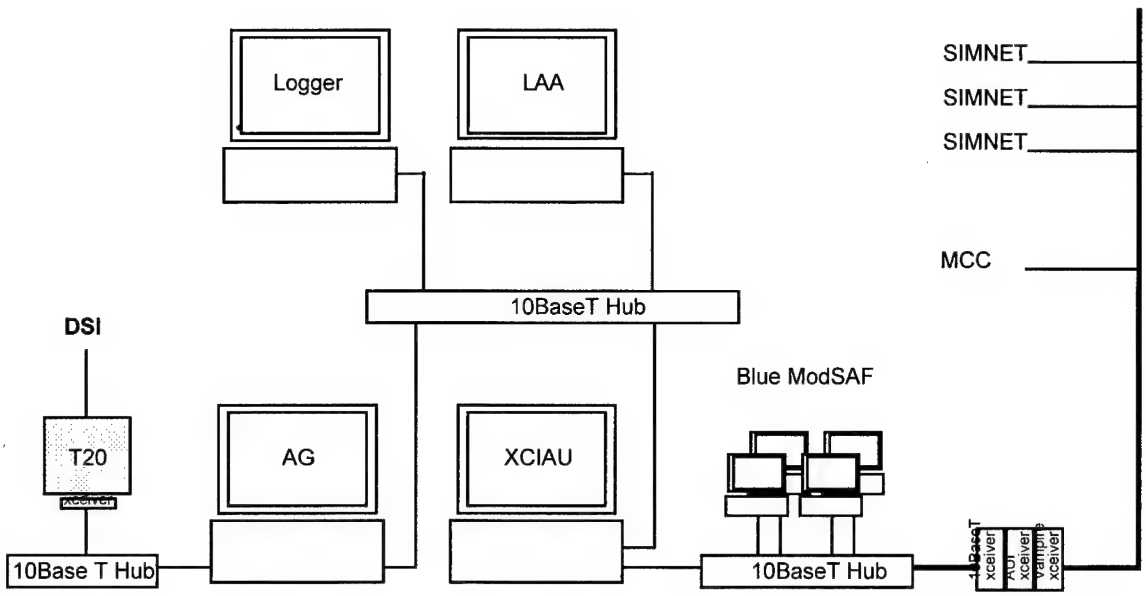


Figure 4.6.1-3 Remote Network With SIMNET Simulators

4.6.2 Wide Area Network

Wide Area Network communications connect all remote participants with the central technical control hub site. The Application Gateway function serves as the primary interface between local and remote sites. Each participating site must have an Application Gateway and access to the DSI. The DSI provides the long haul communication services.

4.6.2.1 Application Gateway

The amount of packet information that can be passed through a Wide Area Network (WAN) is normally more restricted than the amount that can be passed through a local area network (LAN). The AG uses two techniques to reduce the amount of traffic that is passed on a WAN:

1. Load Leveling. Load leveling provides flow control when transmitting information from a LAN to a WAN. When information is received by the AG which exceed a certain rate, the information is buffered and transmitted over a longer period of time. This helps prevent lost packets by reducing the load on the WAN.

2. Quiescence. Quiescence reduces the traffic on a WAN by reducing the time that updates are sent over the WAN for entities that are not changing state. To keep track of entities, certain DIS/SIMNET applications require certain update rates. For instance, in ModSAF, vehicle updates for even stationary vehicles are sent once every five seconds. To insure that applications get the needed updates, when an AG finds a entity that is not changing state, it sends a Quiescence PDU, which identifies all quiescent entities, every two minutes. The AGs on both LANs then track the quiescence entity. While the entity remains in quiescence the AG on the receiving end will automatically generate the entity PDU to send to the applications on its end.

The AG hardware platform for STOWEX 96 was an SGI Indigo 2 R4400 running IRIX 5.3. The AG uses two Ethernet ports in order to transfer data between the local area network and the WAN (DSI).

4.6.2.2 DSI

The DSI is a multiprotocol WAN and network management service which supports a broad range of warfighting interoperability activities. The primary purpose of the DSI is to provide a communications pipeline which enables physically distributed and dissimilar virtual, live and constructive simulations programs to interoperate in advanced warfighting simulations. It supports traffic from various virtual and constructive simulation sources such as DIS, SIMNET, Corps Battle Simulation (CBS), BBS, Air Warfare Simulation (AWSIM) and the Aggregate Level Simulation Protocol (ALSP) Confederation. The DSI also serves the command and control community with Video Teleconferencing (VTC) and Distributed Collaborative Planning (DCP). The DSI has over 100 DoD users in the continental United States (CONUS), Europe, Hawaii, Japan and Korea.

The DSI is composed of a number of router hub sites which together form the WAN backbone. Each of the hubs are multiply connected to the other hub sites. User sites are connected to the backbone hubs in a star configuration. The user sites are configured with one to four routers and associated hardware (i.e., gateway and Ethernet boards) each,

depending on user requirements, to handle classified or unclassified data. The DSI employs a number of routing protocols including Host Access Protocol (HAP), Internet Stream Protocol (ST-II), Frame Relay, Open Shortest Path First (OSPF), Exterior Gateway Protocol (EGP), Shortest Path First (SPF), Internet Protocol (IP), User Datagram Protocol (UDP), Transmission Control Protocol (TCP), and Internet Stream Protocol (SDP).

The network configuration used for STOWEX 96 is shown in Figure 4.6.2.2-1. Houston Associates, Inc. (HAI), the contractor responsible for maintenance of the DSI, originally configured each site except the ASC with dual homing capability, or having a primary and a secondary DSI connection in order to provide automatic backup in case of DSI failure. This configuration was only partially successful, as discussed in sections 5.4.2.3 and 5.4.3.3 of this document. The final DSI configuration had dual homing for the NSC, Fort Riley and Fort Knox. Fort Rucker and the ASC used a single connection since one of Fort Rucker's connections was not working, and the ASC did not have the equipment to support dual homing.

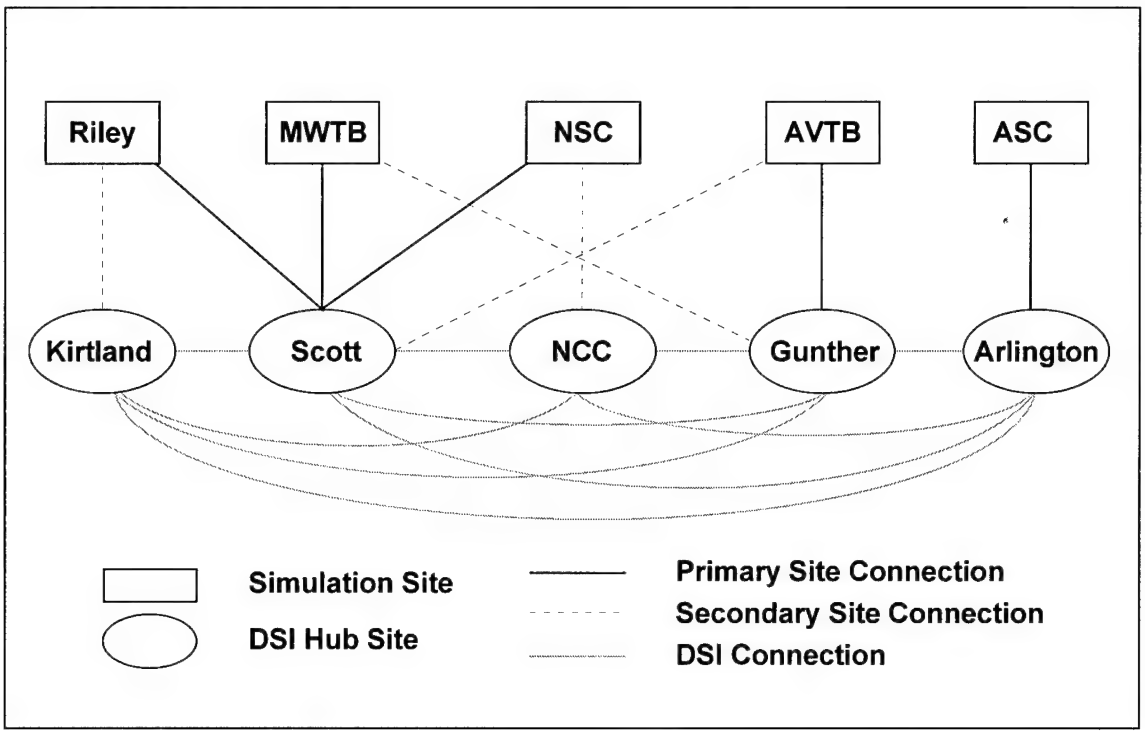


Figure 4.6.2.2-1 DSI Configuration, STOWEX 96

4.6.3 Test Support Tools

A network analysis capability should be provided at each participating STOWEX site in order to assess network traffic loads in support of troubleshooting functions.

During the functional testing, entity loading data was manually collected for each of the ModSAF Farm machines. The capability to collect statistics automatically from

ModSAF for real-time display and logging would provide more consistent data needed to optimize the Farm load leveling process and could assist in the identification of performance limitations.

While not an operational necessity, it is efficient to have a PVD adjacent to the manned simulator used during test for technical control purposes. During integration and test periods, a PVD provides the only clear method to communicate scenario information between technical control personnel and manned simulator operators.

5.0 STOWEX 96

The following section summarizes the engineering activities of the STOWEX 96 Delivery Order, including the engineering planning, architecture development, test and integration, exercise support, and post exercise impressions.

5.1 Planning and Analysis Phase Summary

The planning activities that occurred included the planning and scheduling of the technical activities, performing site surveys of the STOWEX 96 sites, establishing and implementing the mapping among simulation components, and providing any supporting equipment needed for the exercise.

5.1.1 Site Survey

Site surveys were performed for the NSC, the BSC, and the Fort Knox MWTB and MWSTC facilities. A site survey checklist was developed prior to visiting each site. An updated list is provided in Appendix B. Key elements included:

- Space
  —NSC: provide space for the STOWEX infrastructure hardware and technical control personnel
  —Fort Riley: provide space for STRIPES and technical control equipment as required.

- Power
  —NSC: provide power for platforms and monitors for up to 10 Farm processors, an OPSIN, a Farm PVD, 2 STRIPES 2D and 3D suites, 4 XCIAUs, a data logger and peripherals, an AG
  —Fort Riley: provide power for platforms and monitors for at least a data logger and peripherals, STRIPES 2D and 3D, an XCIAU, an AG.
  —If an Onyx is procured for the STRIPES 3D, the site should provide 220 power;

- Support equipment (tables, racks, special stands for 37” monitors)

- Inter- intra- building communication (data, voice) capability
  —type (including ability to dial long distance)
  —number
  —location, including proximity to equipment: technical control equipment should be co-located in order to reduce the number of technical control personnel needed per site.

- Site access
  —NSC required visitor requests/clearances
  —Fort Riley, Fort Rucker, and Fort Knox: no visitor clearances required

The site surveys determined that there was sufficient power for the equipment to be added to both the NSC and Fort Riley. The Onyx procured for the NSC was configured with 110 power and did not require additional 220 source to be added to either of the STOWEX rooms. However, the Onyx does need to be reconfigured for 220 power. This will require NSC to provide a 220 power source for future utilization. Commercial telephone lines were added to both the NSC and Fort Riley in support of exercise control and technical control voice communication needs.

5.1.2 Mapping

In order to ensure interoperability among all of the simulations and simulators, terrain and entity databases used by the various simulations were mapped. For STOWEX 96, these simulations consisted of:

- BBS
- ModSAF
- STRIPES
- SIMNET manned simulators (M1, M2, RWA, Stealth)
- DIS LRS manned simulators (ARSI, RCVS, Dial-a-Tank)

Terrain interoperability is required in order to ensure accurate x-, y-, and z- coordinate locations of vehicles and terrain features within the simulation, and equivalent perceptions with respect to detectability, cover, concealment and line-of-sight between manned simulators and computer generated forces. For STOWEX 96, all simulations and simulators used the "large" NTC terrain database, denoted as "0101."

Appendix C provides a summary of the mapping efforts involved with the SIMNET dynamic element database (DED) and contains the mapping tables of vehicle types and weapon systems/ammunition.

5.1.3 Communications Support

STOWEX 96 required three types of non-digital communications: commercial voice networks for exercise and technical control, video teleconferencing, and tactical communications capability among the exercise participants at Fort Riley, Fort Knox, and Fort Rucker.

Site capabilities for video conferencing and commercial voice telephone lines for inter-site exercise control and technical control communication were used. As a result of the PW95 Alpha and Beta Test experience, existing DSN capability at Fort Riley and the NSC were augmented with commercial telephone lines. Ten-way conferencing for both the Technical and Exercise Control networks was coordinated with the NSC DOIM for the training exercise. Daily conference calls throughout the test / integration phases and during the exercise were established by Technical Control personnel at NSC utilized commercial telephone lines. Diagrams of the networks, conference call instructions, and a telephone directory are contained in the Communication User's Guide in Appendix D.

For STOWEX 96, meetings, rehearsals and the first AAR were conducted via VTC between Fort Riley and Fort Knox. The VTC was performed utilizing the DSI "Dual Homing" feature to provide real-time VTC simultaneously with the training exercise data streams. This approach contrast with the Prairie Warrior 95 which required that data streams generated by the training exercise be brought down by HAI and VTC streams subsequently established. More extensive use of video teleconferencing with all participating sites was originally planned but was limited by lack dual homing capability at Fort Rucker and the Army Simulation Center (ASC). Additional VTC information, original VTC schedules and moderator check-list is contained in the Communication User's Guide in Appendix D.

The STOWEX 96 implemented tactical communication networks which simulated the Command network, the Administrative and Logistics (A&L) network, the Operational and Intelligence (O&I) network, and Fire Support (FS) network. A fifth network for the Fire Support Digital network was planned but not implemented due to difficulties encountered by the Department of Information Management (DOIM) in interfacing the Tactical Terminal Adapter and the Secure Telephone Unit (STU) required for secure transmissions.

Network bubble diagrams for each of the tactical networks are provided in the Communication User's guide in Appendix D. The overview diagram of the Command radio / telephone network is shown in Figure 5.1.3-1. A more detailed radio / telephone interface diagram is contained in Appendix D.

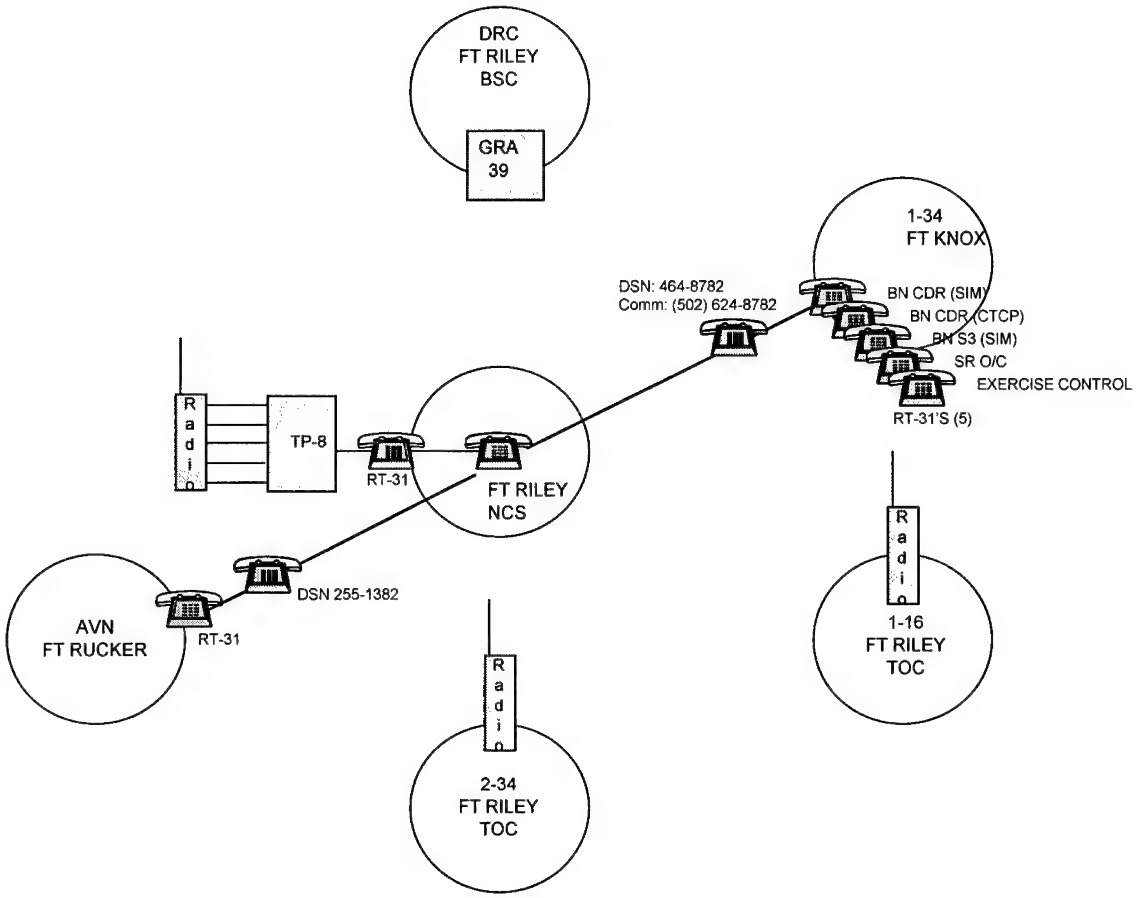


Figure 5.1.3-1 Command Net

The RT-31 Tone Remote and TP-8 Tone Termination Panel provided remote control of the two-way FM radio over commercial telephone lines. The RT-31 generated a tone when pushed-to-talk that keyed the radio transmitter. The TP-8 decoded the tones and provided the direct interface with the FM radio. The specific radio frequency used was dictated by the FM radio transceiver. The RT-31 also provided the capability to monitor network communication via the built in speaker and provided a handset with a push-to-talk switch. This approach provided a more realistic interface to tactical communications than the previous approach of using commercial speaker phones between sites. RT-31 User's Instructions are provided in the Communication User's Guide, Appendix D.

5.2 Exercise Design and Development Phase Summary

The engineering activities that supported the STOWEX 96 exercise design and development phase consisted of (1) defining and coordinating basic interoperability issues, (2) establishing the system architecture and STOW-A hardware infrastructure for the NSC hub and each remote site, identifying the configurations of Commercial-off-the-Shelf (COTS) and GFE software, and (3) identifying and implementing necessary modifications of BBS-ModSAF linkage and technical control software components.

The DIS protocol to be followed during the STOWEX 96 was DIS Draft Standard Version 2.0.3. The terrain for the STOWEX 96 was the NTC "0101" database. The brigade level exercise for STOWEX 96 expected to produce approximately 300-400 virtual entities; however, the design goal for the BBS-ModSAF linkage was to process a peak of 500 virtual entities on the local Farm without causing a system crash.

Figure 5.2-1 presents a top level system diagram depicting the STOWEX 96 at NSC and BSC. Forts Knox and Rucker had an AG and XCIAU but no STRIPES. ASC was configured similarly to BSC.

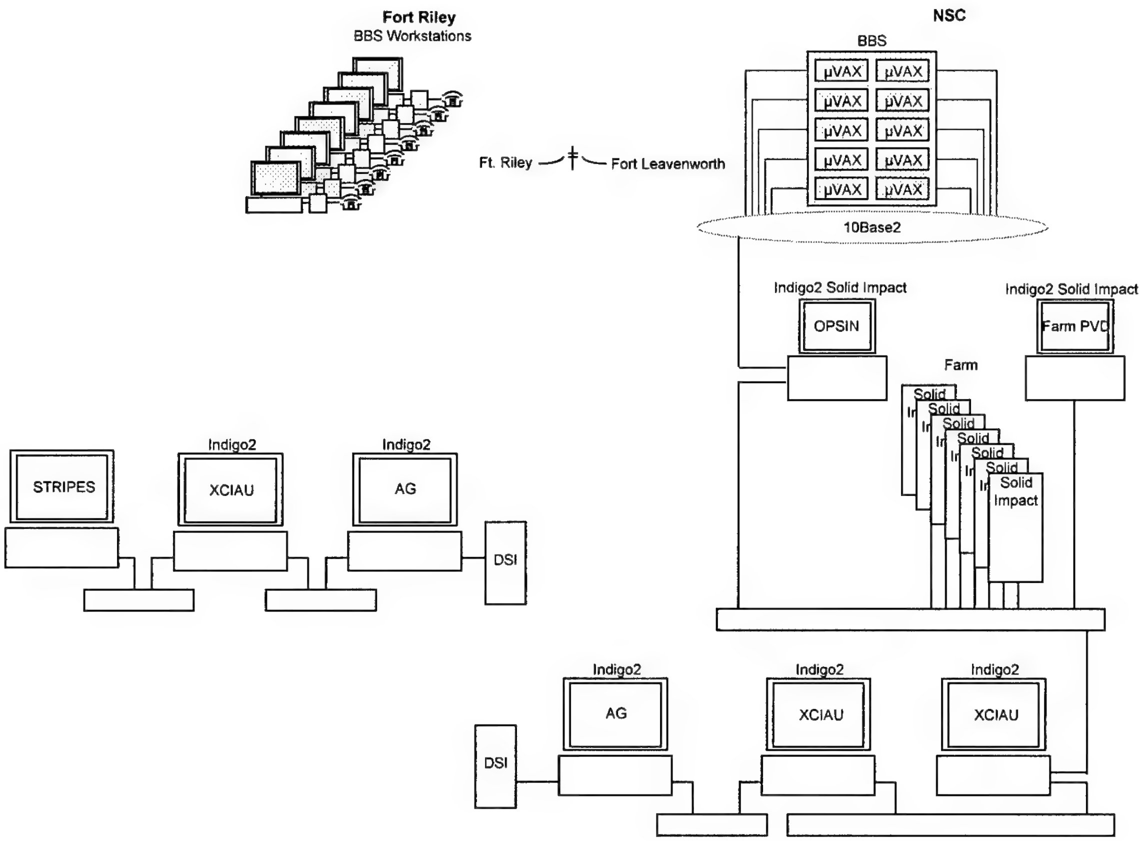


Figure 5.2-1 STOWEX System Diagram

The primary requirement was to support the training objectives of the 1st Infantry Division (1ID). One of the keys to meeting this requirement was the proper sizing of the ModSAF Farm. Although an exercise directive, which would have defined the task force size, was not available early in the program, it was anticipated that the Farm would need to support 300-400 entities which was well within the 500 entity goal. Based on PW 95 experience using R4400s and IRIX 5.3 and the more than two-fold improvement in throughput that was expected to be gained by using R10000s and IRIX 6.2, it was agreed that eight back-ends would be sufficient to support the training exercise.

Site diagrams containing LAN architecture, workstation type, and workstation system function (AG, XCIAU, Logger, etc.) were the primary mechanism for defining the system

design. Design and program reviews were conducted and, with STRICOM concurrence, system requirements and design changes were made. Changes to the baseline system design included:

- Addition of the ASC view-port;
- Final configuration of ModSAF workstations for Fort Knox and Fort Rucker;
- Increased number of SIMNET simulators at Fort Knox;
- Addition of ModSAF workstation at NSC to play OPFOR air;
- New hardware implementation for tactical communication based on tone remote technology;
- Addition of BBS workstation for AAR support;
- Reconfiguration of the Fort Knox Blue ModSAF;
- Addition of a STRIPES extension monitor;

Figures 5.2-2 through 5.2-7 provide the resulting STOWEX 96 architecture diagrams by site. Note that at the ASC (Figure 5.2-7), STRIPES was hosted on an Onyx that was loaned to STOWEX by SGI. This Onyx was replaced by a Maximum Impact after the Exercise.

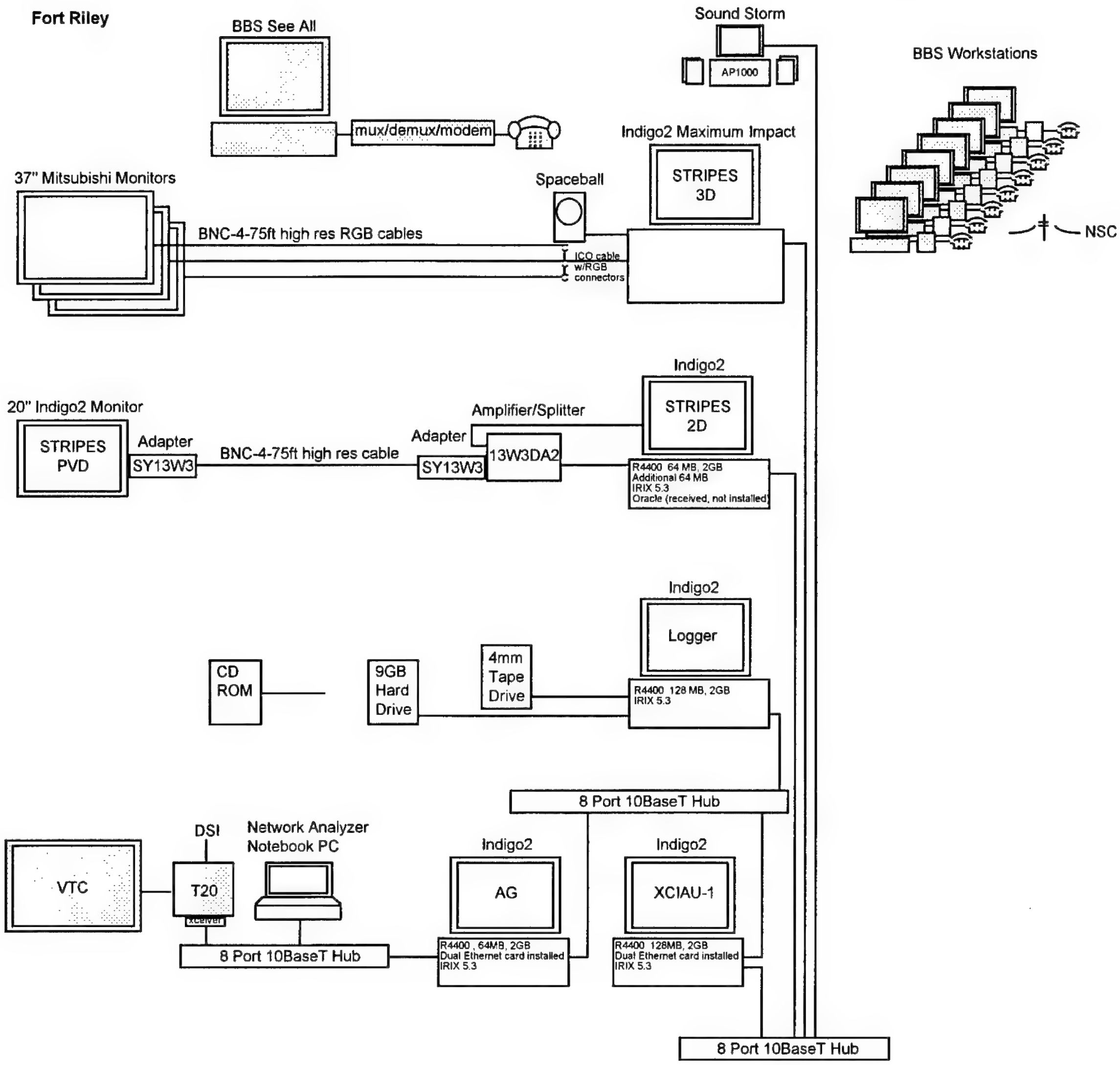


Figure 5.2-2 Fort Riley System Diagram

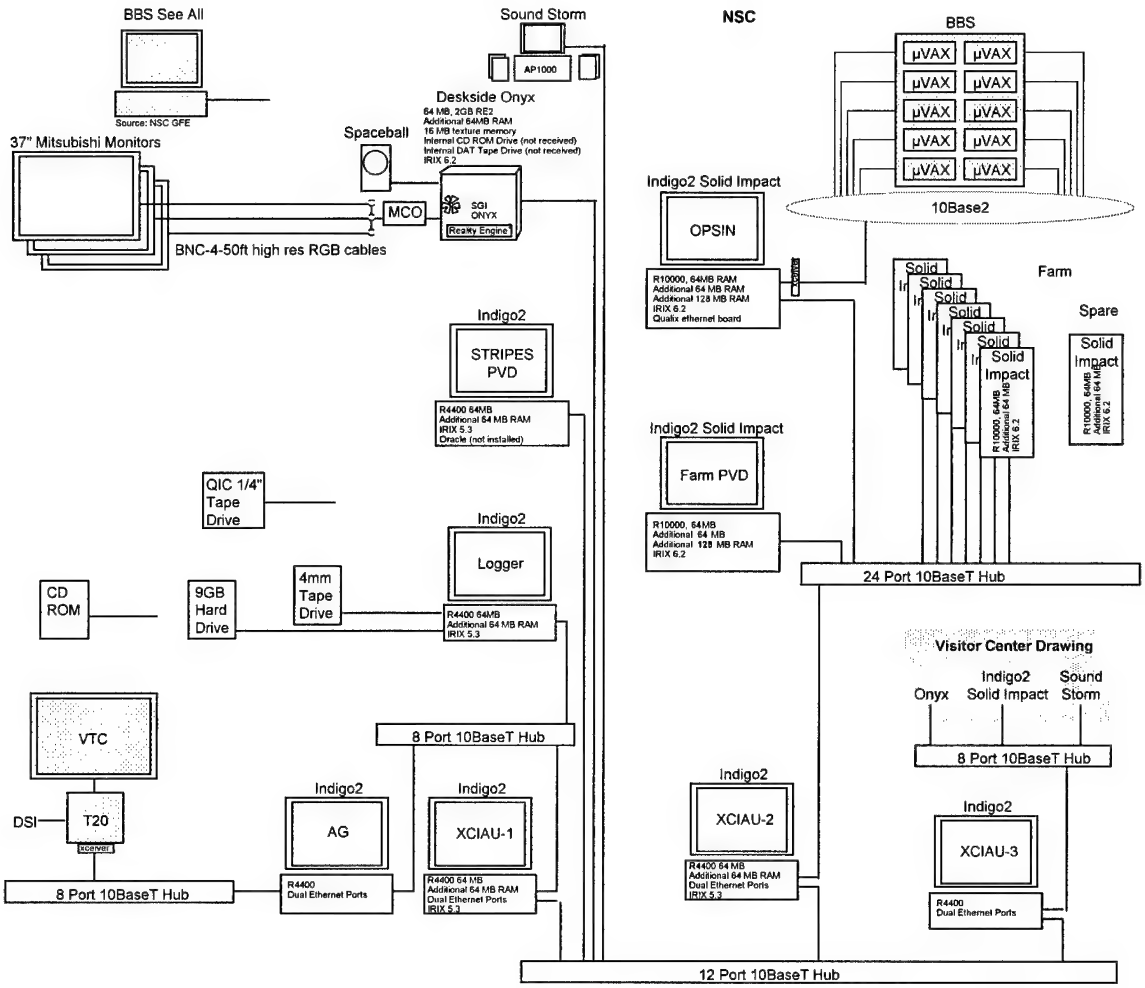


Figure 5.2-3 National Simulation System Diagram, Technical Control

NSC Visitor Center

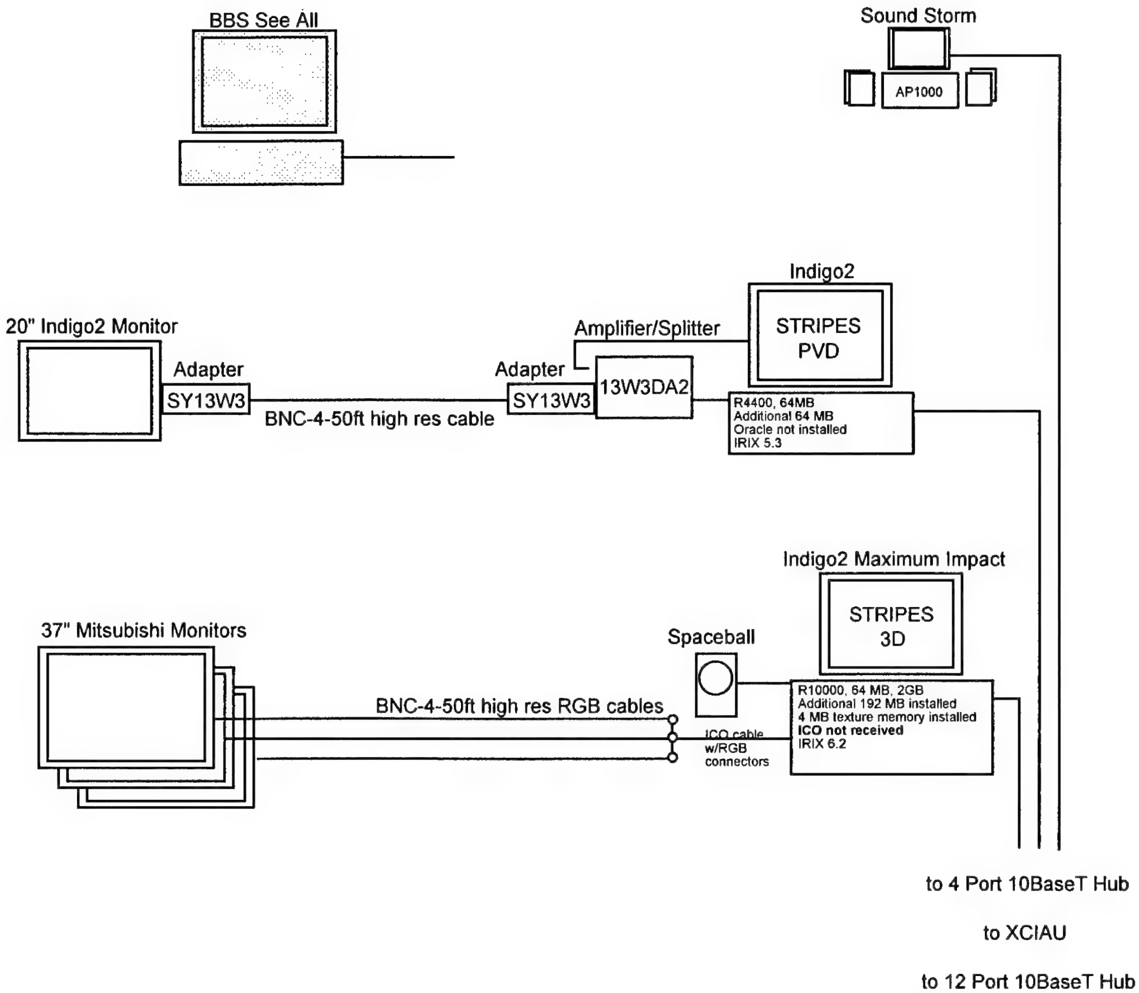


Figure 5.2-4 National Simulation System Diagram, Visitor Center

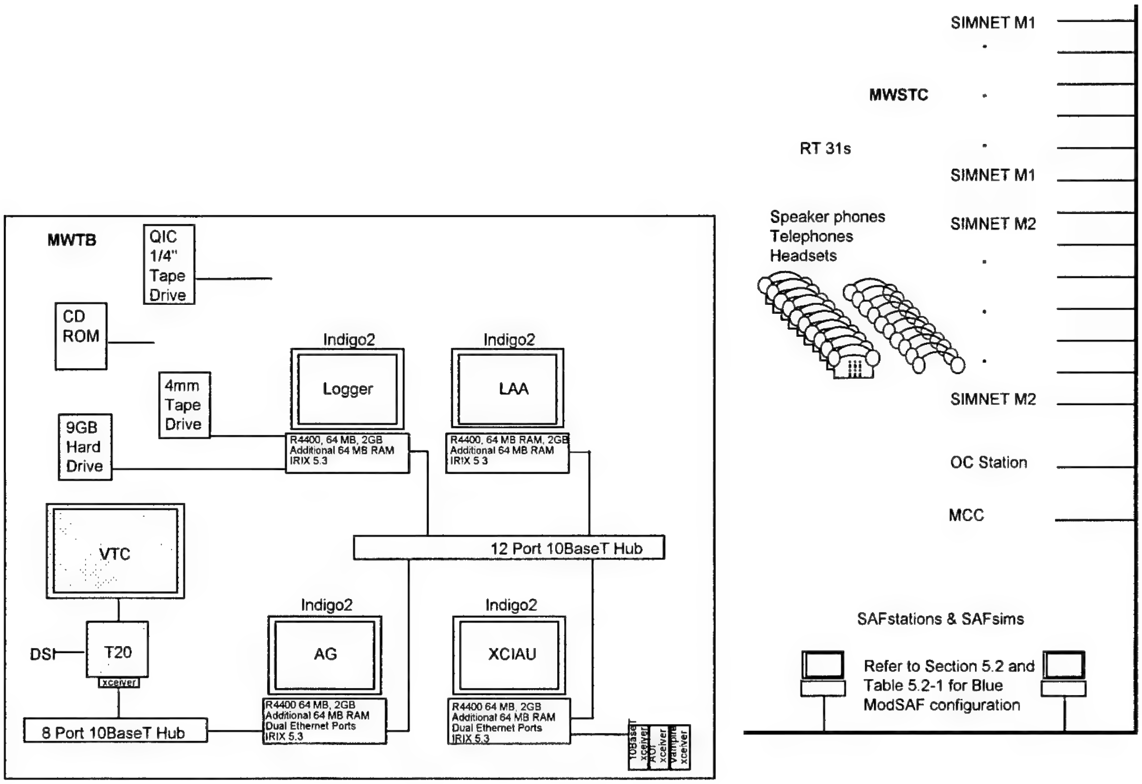


Figure 5.2-5 Fort Knox System Diagram

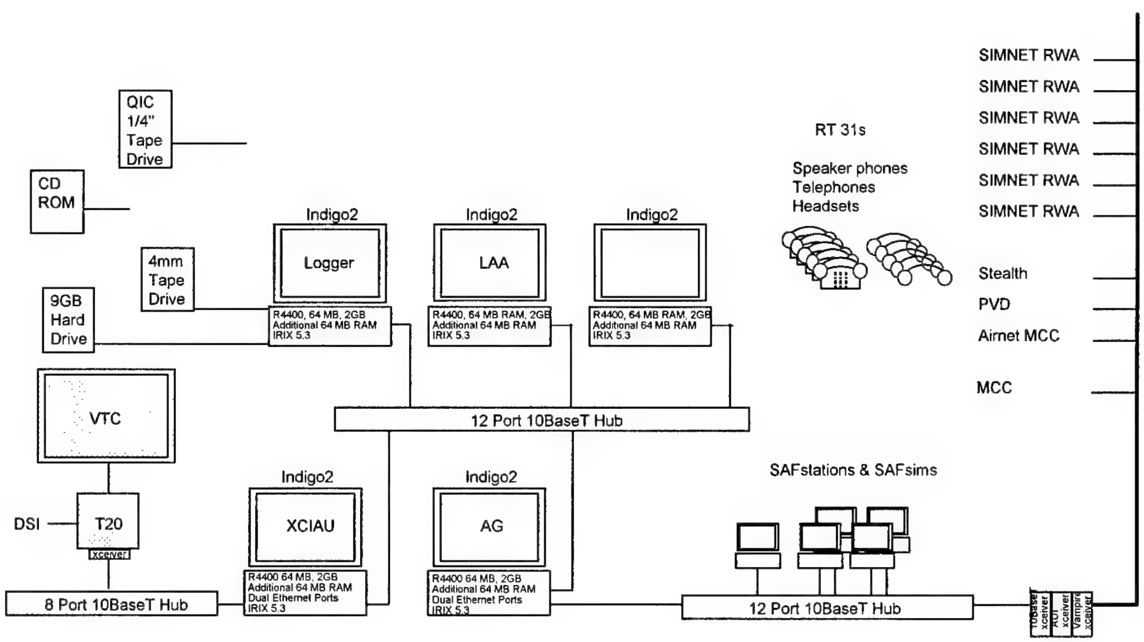


Figure 5.2-6 Fort Rucker System Diagram

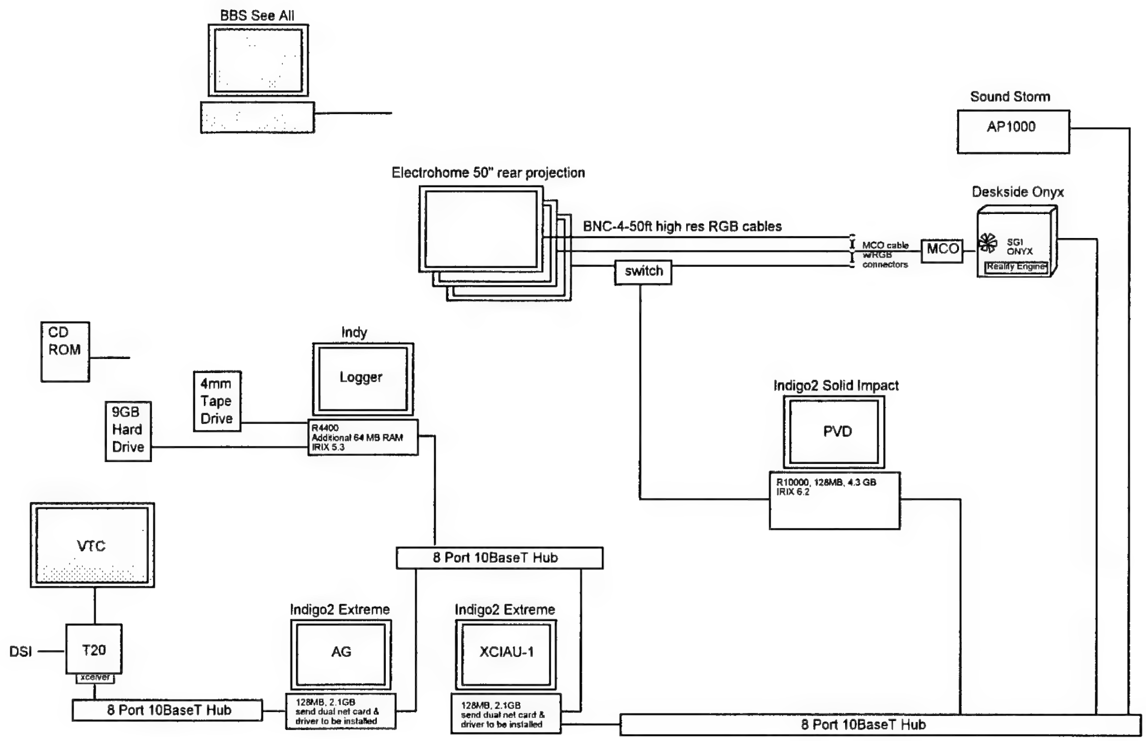


Figure 5.2-7 Pentagon System Diagram

The manned simulators at Fort Knox were part of a Task Force that was augmented by blue forces in ModSAF. The original plan for these ModSAF forces utilized the Observer Controller Stations in the MWSTC with allocations described in Table 5.2-1. Each of these OCSs have older SGI hardware (Indigo and Indy computers) that have been sufficient for older versions of ModSAF. Prior to the final integration and test, at the request of the STOWEX team, the Force XXI Training Program (FXXITP) Contractor at Fort Knox configured newer FXXITP SGI Indigo2 200Mhz R4400 processors augmented by MWTB assets, and used the resulting suites in lieu of the MWSTC OCSs. This was requested as a risk mitigator to reduce the potential for ModSAF system problems due to overload caused by the increased exercise size and requirements anticipated with STOWEX.

Table 5.2-1 STOWEX 96 Fort Knox Blue ModSAF OCS Configuration

Station Number	Station Function	Entity Count	Configuration
OCS 1	OPFOR		No changes
OCS 2	A Company	5-25	Pocket (1 machine as front end and back end), 1 logger
OCS 3	EN/ADA	40	1 front end, 1 back end
OCS 4	B Company	5-25	Pocket (1 machine as front end and back end), 1 logger
OCS 5	CSS	40	Pocket (1 machine as front end and back end)
OCS 6	MTR	10	Pocket (1 machine as front end and back end)
OCS 7	SR O/C		1 front end, 1 logger
OCS 8	C Company	5-25	1 front end, 1 back end, 1 logger
OCS 9	EXCON	150 (night)	2 front ends, 2 back ends
OCS 10	D Company	5-25	1 front end, 1 back end, logger
OCS 11	(none identified)		
OCS 12	Scouts	12	Pocket (1 machine as front end and back end), 1 logger

The final Blue ModSAF configuration used Indigos for loggers. All other machines were Indigo2 with the exception of the Mortar front end and the Scouts front end which were Indys.

5.3 Procurement and Equipment Shipment Planning

The equipment identified in the STOWEX 96 Bill of Material (BOM) was provided to the buyer who, by procedure, solicited multiple quotes to identify low bidders where appropriate. When equipment was received, it was logged and checked out to Engineering, set up in the OSF and used in Integration and Test.

The requirements for STOWEX 96 shipping included the identification of hardware and software configuration of each component, utilizing the Configuration Management organization. A safe, timely and cost effective method of shipment was identified to support both OSF integration schedules and site test schedules. Land carrier was selected for the NSC and BSC delivery due to the amount of equipment; air freight was used for Fort Knox, Fort Rucker, and ASC. No special precautions for computer information security was required since STOWEX 96 is not classified. When equipment availability has the potential to impact schedule, expediting methods of priority shipment and drop shipment to site were employed.

Spares were shipped in order to provide uninterrupted exercise support. These spares included CPUs (box level replacement), memory and dual Ethernet cards (internal component/board level replacement), peripherals (cables, hubs, storage devices), and site assets or resources (available power, types of power).

Appendix E provides the tables identifying the destination of equipment received in the OSF as well as tag numbers, function, and configuration. Appendix E also provides figures used in the shipping planning that demonstrate how the shipping lists were derived from the architecture drawings. These figures do not reflect the post exercise reallocations. The shading of the Sound Storm indicated that this component had to be shipped to the sites directly by the vendor. The shipping addresses are provided in Appendix E. For the Pentagon, it was recommended that items be shipped to the Lockheed Martin facility since a Pentagon address adds an additional day to the timeline.

Fort Knox and Fort Rucker had sufficient ADST GFE simulation equipment to support STOWEX 96. Much of ASC equipment was provided as GFE or supported by assets loaned by Silicon Graphics. Additional support equipment, primarily for both voice and tactical communications was shipped to Fort Knox and Fort Rucker via overnight air.

5.4 Integration and Test Phase Summary

The Test Phase prior to the STOWEX 96 Exercise was divided into three periods: the Operational Support Facility (OSF) Integration and Test (I&T), Functional Test 1 (FT1), and Functional Test 2 (FT2). The fundamental objectives of each period were the same:

1. To ensure that the STOW-A 1.5 Simulation subsystems including BBS, ModSAF, OPSIN, XCIAU, AG, and STRIPES would support the STOWEX 96 exercise conducted in September 1996,

2. To disclose latent deficiencies of the system to the customer and to propose work-around solutions for those deficiencies prior to the exercise,

3. To provide a systematic approach to validate the development and integration of STOW-A 1.5 Simulation sub-systems, and

4. To rehearse initialization, troubleshooting, restart, and shutdown procedures to be used in the STOWEX 96 exercise.

An additional objective of the Test Phase was to develop a series of structured test procedures that could be used in conjunction with future STOW-A exercises. These test procedures were used both at the OSF and at the sites to test system stability, system integration, and to verify the correction of PW95 deficiencies and performance enhancements in the STOW-A 1.5 baseline. Appendix F contains specific test procedures that were executed. This approach ensured that appropriate actions were being input by the system operators and the results were observed and documented.

OSF I&T and FT1 were performed in testing environments designed to support specific test objectives; FT2 was performed in a fully operational environment.

In spite of initial schedule delays and some recurring software and DSI network problems, objectives for each of the test periods were met and the test period was successful.

5.4.1 OSF

5.4.1.1 Objectives

The OSF I&T was scheduled for performance at the OSF in Orlando, FL, from 1 July through 8 August 1996. Integration was scheduled from 1 July through 21 July and Test was scheduled from 22 July through 8 August.

During the Integration phase, integration and test personnel installed and checked out hardware and system software, test new software capabilities and incorporated required modifications. The Test phase was to be a structured dry run of the individual test cases that were to be performed during FT1 and FT2.

The initial objective of this period was to set up and configure the hardware and the system suite. Memory, harddrives, and Ethernet cards were added to the SGI computers. Compilers and software drivers for the Ethernet cards were loaded and checked out. Oracle was loaded onto the R10000s that were designated as the STRIPES 2D machines. The hardware and software configurations were identified on system diagrams, on machine tags, and confirmed with Configuration Management. Machines designated for OPSIN/ModSAF were configured with 256 MB of memory and the swap space was changed accordingly. Once the configurations were completed, the hardware was checked out. Systems were preloaded with the appropriate application software, and the machines were functionally configured and identified for the specific applications such as STRIPES, XCIAU-1, XCIAU-2, and AG. Once this was accomplished, hardware performance and stability were tested.

An additional objective was to test local system stability. The system was assembled in the target system configuration. Wherever possible, target hardware performed in its exercise usage. This provided actual experience with the new hardware. The only software changes allowed during this stage were those aimed at fixing catastrophic problems, and low-risk fixes to known deficiencies.

Two major issues were identified during the OSF integration period. First, three of the machines failed within the first two weeks. Equipment that had been designated for the OSF was shipped instead to the NSC as spares. Second, the new machines came with a new operating system, IRIX 6.2, and it was soon determined that there were problems with software that had been compiled under IRIX 5.3.

5.4.1.2 Test Suite Configuration

The Test Suite Configuration used for the OSF I&T is given in Figure 5.4.1.2-1 OSF System Configuration Diagram, Integration and Test.

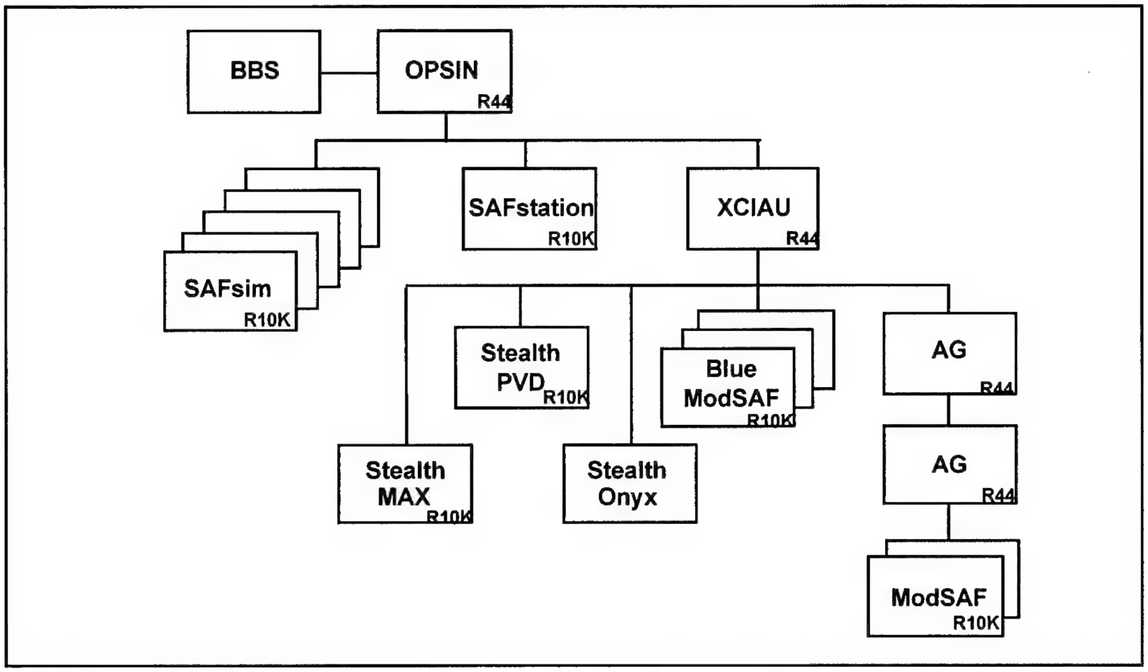


Figure 5.4.1.2-1 OSF System Configuration Diagram, Integration and Test

5.4.1.3 Events Summary

The Schedule for the OSF I&T needed to be compressed due to late receipt of system hardware from vendors. This necessitated running the Integration and Test Phases simultaneously over the course of six days. The planned date for shipping hardware to the field sites was still maintained and the impact of the schedule delay to the overall test program was minimal.

Some of the hardware was shipped directly to the field sites and could not be tested prior to site installation. This hardware included Sound Storms, RT-31s/TP-8s, and some replacement and loaner SGI machines. In addition, the scope of the I&T activities was further limited by the unavailability of the M1 and RWA SIMNET simulators. Much of the mapping and other tests utilizing the simulators planned for I&T needed to be deferred to FT1.

The System Stability Test and System Integration Test were expanded and procedures for individual test cases were corrected or augmented as required. An initial set of procedures for system Start, Restart, and Shutdown was written and tested against the local system.

The local OSF STOW-A system was determined to be stable. No system crashes were reported with the exception of a repeatable crash of the STRIPES 3D when the Log Playback function was invoked. This problem was reported and corrected in a subsequent release of STRIPES software.

The results of individual deficiency-related test cases varied: several known deficiencies had not been fixed, to include disaggregated FWA and RWA movement problems, and mapping inconsistencies. Test activities were formally logged and are presented in Appendix G.

5.4.2 FT 1

5.4.2.1 Objectives

FT1 was scheduled to be conducted at the National Simulation Center (NSC) in Fort Leavenworth, KS from 12-19 August 1996. The NSC provided the Simulation Infrastructure (STOW-A System and MicroVAX Farm for BBS), and a limited number of technical and operational personnel. NSC staff, augmentees and contractor personnel from the ADST II team supported this test.

The main objectives of this phase were as listed in section 5.4. Additional objectives included:

1. Verification of the functionality and hardware configuration of the STOW-A system installed at the NSC to include the core suite, the upgraded ModSAF Farm, Technical Control (Stealth CPU & Monitors, Sound Storm), and Visitor Center (Stealth CPU & Monitors, Sound Storm, STRIPES),

2. Providing a systematic approach to validate the local integrity and stability of the STOW-A 1.5 Simulation sub-systems at the NSC,

3. Providing a systematic approach to validate the long haul connectivity of the STOW-A 1.5 Simulation sub-systems,

4. Rehearsal of the STOWEX 96 exercise scenario at a single site, and

5. Verification of the ModSAF Farm's ability to handle an expected exercise load of approximately 500 local entities.

Validation of long haul connectivity necessitated involvement from all sites that were to participate in the STOWEX 96 exercise: Fort Riley, Fort Rucker, Fort Knox and the Pentagon, as well as the NSC.

The only software changes to be made following FT1 were those aimed at fixing catastrophic problems.

5.4.2.2 Test Suite Configuration

The Test Suite at the start of FT1 was located solely at the NSC. The configuration used for that period is given in Figure 5.4.2.2-1 NSC System Configuration Diagram, Functional Test 1. Some equipment, including the Stealth Onyx and the OPSIN R4400 were replaced or shipped to other locations in order to meet the required exercise configuration. By the end of FT1 the test environment was the same as that used in the exercise. Facilities and equipment diagrams for the exercise configuration are given in Section 5.1.

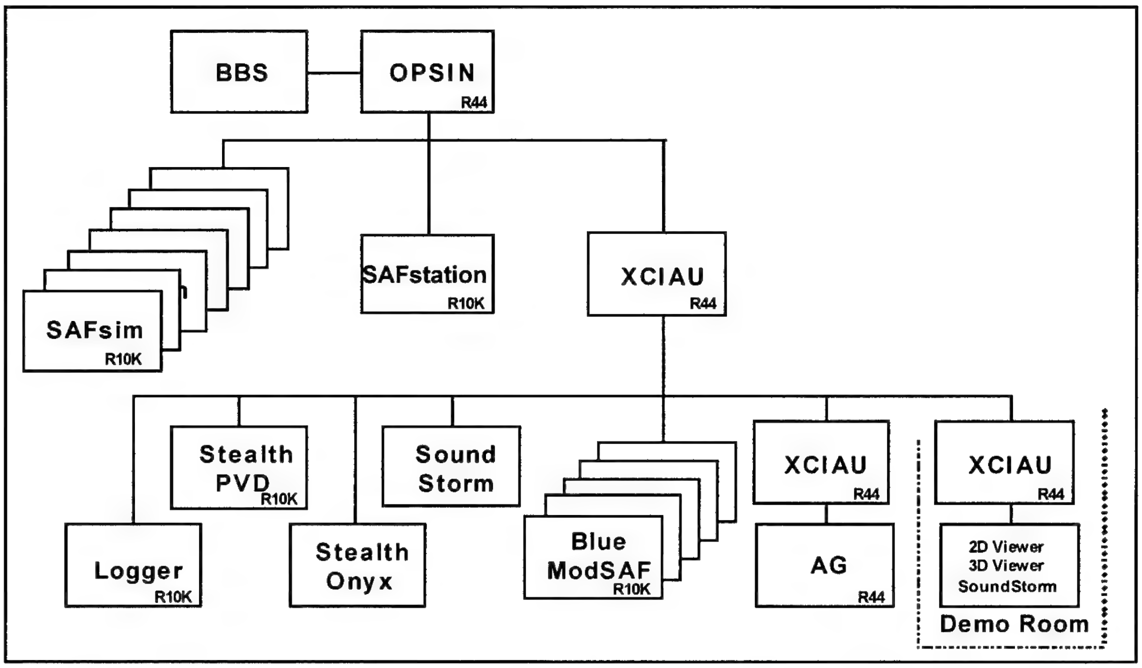


Figure 5.4.2.2-1 NSC System Configuration Diagram, Functional Test 1

5.4.2.3 Events Summary

The scheduled start of FT1 was delayed by two days in order to accommodate equipment shipping and setup. FT1 was started on 14 August and finished on 21 August 1996.

The following tasks were completed:

1. Hardware and Software configurations for FT1 were documented for test.

2. Startup, Restart, and Shutdown procedures were expanded, corrected and formalized; input from NSC personnel was solicited and incorporated.

3. The System Integration Test Procedure was expanded, successfully run, and documented. IP addresses for all sites were documented for testing purposes.

4. Procedures for the System Stability Test, as descriped on page 43 and in Appendix F, -were completed; the test was run daily and following each software modification.

5. The Long Haul Connectivity Test was successfully run and documented to ensure connectivity between sites.

6. Mapping tests were run, including comparison tests of OPSTATE to task frames, 3D models, and munitions. These tests were run at the NSC and between sites. Fixes for 3D visual mapping were accomplished in real time for the simulators and the Stealth. These fixes were intended to provided correlation between the simulator, Stealth visuals, and the BBS vehicle types.

7. A test of the SoundStorm was run and documented in the test log to ensure correct battle sound effects.

8. A dead hulk test case was run and documented in the test log.

9. The OPSIN hardware was upgraded from an R4400 to an R10000 with a Qualix Ethernet card. OPSIN and ModSAF fixes were incorporated to increase system stability. OPSIN was recompiled for IRIX 6.2.

10. LRS vehicles at Fort Knox were added to the exercise plan. Test cases for specific LRS vehicles were designed and run in order to see if the presence of these vehicles would adversely impact the system.

11. Load testing with artillery firing and full tactical maneuver and engagements achieved loads in excess of 600 local Farm vehicle entities, 700 total vehicle entities, and 1200 total aggregated/disaggregated entities.

FT1 experienced a series of ModSAF Farm crashes and disaggregation anomalies, such as disaggregating vehicles "disappearing" from the Farm. Much time was spent trying to diagnose the cause of these problems. The problems were traced to an unreliable IRIX 6.2 ModSAF compilation. ModSAF was recompiled to an IRIX 5.3 executable, which significantly improved system performance and virtually eliminated the Farm crashes and disaggregation anomalies.

A software change incorporating a dead hulks "fix" was unsuccessfully tested. The purpose of this fix was to remove dead hulks from the playing board in order to reduce system load. The ModSAF recompile improved system performance enough that pursuing the dead hulks matter was dropped.

The importance of establishing and maintaining a structured set of Start, Restart and Shutdown procedures, and developing a set of system rules and constraints that could be used at all sites was emphasized when failure to follow existing procedures resulted in improper initializations and errors on restart. These procedures and rules continued to

evolve and became the Technical Control Document, reproduced in Appendix H of this document.

The testing of minefields identified the following:

- Mine placement in the minefields was too sparse to be effective;
- Workarounds to increase the mine density and to provide breaching methods did not provide a good solution.

Although initially there were no apparent BBS to ModSAF mapping problems, mapping discrepancies between the BBS, the Stealth and the simulators were revealed. AcuSoft indicated in a teleconference that mapping problems were due in part to the use of an old mapping table (an AcuSoft configuration management problem). Changes were faxed and incorporated. Additional changes to the mapping files were made as deemed necessary. Once the problems were identified and fixes were made the system appeared to become significantly more stable.

The local NSC environment was healthy enough to bring the other sites into the test environment earlier and more fully at this stage than anticipated. The Long Haul Connectivity Test was finalized and successfully run. SIMNET vehicles were introduced in a limited capacity to the system. Their presence did not adversely impact the system, except when they were initialized in locations that forced instant disaggregation of numerous BBS units.

The DSI links caused serious problems from the end of FT1 through the middle of FT2, and to lesser a extent throughout the remainder of the test period. Some of the sites, particularly Fort Rucker and Fort Riley, could not see all (and sometimes any) of the remote vehicles. Initial stream sizes were incorrectly set by HAI, and later reset to too low a bandwidth. Eventually HAI found the following configuration to be successful:

NSC:	(200 b * 200 pps * 8) / 1024 = 312 Kbs
AVTB:	(200 b * 200 pps * 8) / 1024 = 312 Kbs
MWTB:	(200 b * 200 pps * 8) / 1024 = 312 Kbs
ASC:	(200 b * 90 pps * 8) / 1024 = 141 Kbs
BSC:	(200 b * 90 pps * 8) / 1024 = 141 Kbs

where the first number is the packet size, the second is the packets per second, 8 and 1024 are conversion factors and the answer is the allotted bandwidth. Total bandwidth for the system was 1.22 Mbs.

In addition, HAI originally configured each site with dual homing capability, as having a primary and a secondary DSI connection in order to provide automatic backup in case of DSI failure. Much discussion and many trial and error solutions were attempted as DSI connections continuously went down. It became evident that Fort Rucker's connection

through Scott did not work; once it was eliminated from the routing, the communications were successful.

5.4.3 FT 2

5.4.3.1 Objectives

FT2 was scheduled to be conducted from 20-30 August 1996. All sites involved in the exercise were scheduled to be involved in FT2, including the NSC, the Battle Simulation Center (BSC), Fort Riley, Kansas, the MWSTC and the MWTB, Fort Knox, Kentucky, the AVTB, Fort Rucker, Alabama, and the ASC at the Pentagon.

The main objectives of this phase were as listed in section 5.4. Additional objectives included:

1. Verification of the STOWEX systems functionality at the exercise control site (Fort Riley), at the SIMNET sites (Fort Knox and Fort Rucker), and at the ASC viewport.

2. Validation of the long haul integrity and stability of the STOW-A 1.5 simulation sub-systems.

3. Verification of communication systems (radio, tone/panel & remotes, speaker phones).

4. To dry run a test scenario that would stress the system in manner similar to that of the STOWEX 96 exercise as defined by 1st Infantry Division (M) Exercise Directive for 1st Bde Combat Team (1BCT) BBS (STOWEX) Command Post Exercise DEVIL WARRIOR 96-19, 3-6 September 1996.

5.4.3.2 Test Suite Configuration

Facilities diagrams and equipment used for FT2 and provided in Section 5.1 are the same as those used in the exercise.

5.4.3.3 Events Summary

FT2 was started on 22 August and ran through 27 August and from 29 August through 2 September 1996. On 28 August the system was given to the customer for their dry run of the exercise scenario. Primary emphasis was placed on running a scenarios as close to the actual exercise scenario as possible in the exercise environment in order to validate the system for the exercise. The System Stability Test with an expanded scenario was used for this purpose.

The following tasks were completed:

1. Hardware and Software configurations for FT2 were finalized and documented for test.

2. Startup, Restart, and Shutdown procedures were finalized, tested and validated.

3. Tactical Communications of RT-31 and TP-8 equipment was tested.

4. System Stability Test was run on a daily basis in accordance with the Test Plan and Procedures.

5. Workarounds were tested for bypassing minefields problems.

6. Mapping issues were resolved.

7. DSI problems were resolved.

The location of BBS HICON was changed from NSC to Fort Riley. NSC retained the BBS See All station and functioned as Technical Control. Late in FT2 control of blue ModSAF was shifted from NSC to the Fort Knox T-site.

Problems with the DSI seriously impacted the progress of FT2. These problems are addressed in section 5.3.2.2. Some of the contractor test activities, including stability testing of area defense and offense and transition from recon to counter-recon, could not be performed prior to turning the test over to the customer. Also, DSI network configurations were often changed overnight and the new configurations would not support testing in the morning. The final DSI configuration had dual homing for the NSC, Fort Riley and Fort Knox. Fort Rucker and the ASC used a single connection (note: ASC did not have the equipment to support dual homing). Final stream size and bandwidth configuration are noted in section 5.4.2.2.

System Stability testing was performed to determine if the system and in particular, the ModSAF Farm, would be stable (would not crash) under exercise conditions. The stability testing was performed in a series of test using pre-defined scenarios developed by NSC personnel. The scenarios provided for blue defense against the controlled engagement by red forces. The total number of red force vehicles in each attack wave, the number of waves, and time between the attacking red force waves were altered (either by running different scenarios or by modifying a scenario extemporaneously) to gradually increase the stress (number of entities) to the system. Blue units were inserted to create spikes in the number of red units forced to disaggregate. In addition, blue ModSAF and BBS artillery was fired during the test. As confidence in the system increased, minefields were added to the scenario. Details of the testing the entity count results are documented in the daily test logs.

When the M1 and M2 SIMNET simulators were added, Fort Knox operators reported that they could not see many of the network entities. While detailed mapping had been performed previously first using NSC assets then with the SIMNET simulators and LRSs at Fort Knox, only minor problems had been identified such as the lack of an OPFOR helicopter in the Chodo database (reference Appendix C, page C-3). The fix that was pursued was to use the Simdo data base which contained an appropriate model for the OPFOR helicopter. A ModSAF scenario containing all vehicle types was provided to Fort Knox for testing purposes but the detailed testing of each model type and ammo typo was not performed prior to loading the data base on the SIMNET Image Generators (IG).

Crashes of the simulator IGs were thought to be related to improper munitions mapping. Munitions mapping was checked and verified or corrected. Results of the munitions mapping tests can be found in the Test Log presented in Appendix G. These changes stabilized the IGs.

Mapping was a problem all the way through to the start of the exercise. Problems with munitions mapping were still being identified the day before exercise start. Final changes were implemented in the XCIAUs rather than in the IG mapping/DED files.

The system was left to run overnight in order to check long term stability. It was still running after 16 hours, with one Farm back end lost due to disk error, and two PVDs down due to memory leaks. These problems were determined not to be significant in terms of the exercise, where coordinated archiving and shutdowns were scheduled on a daily basis.

The LRS vehicles were added to the system in a limited capacity. Introduction of three of the LRS configurations, the ARPA Reconfigurable Simulator Initiative (ARSI), the Reconfigurable Combat Vehicle System (RCVS) 113 and the RCVS 577, produced no additional problems. The Dial-A-Tank Reconfigurable caused system crashes in both the test and local environments, and was initially dropped from the exercise. Eventually, a method of configuring Dial-A-Tank using the XCIAU to filter out parts of the system was established and Dial-A-Tank was reintroduced without any problems.

Minefields and minefield-related problems continued to be an issue through FT2. Since the testing of other functions was considered to be complete, the main focus during this phase was breaching mines with ModSAF or disaggregated BBS vehicles. The workaround strategy, detailed in the Technical Control Document, Appendix H, consisted of limiting red minefields to BBS generated minefields, and having Technical Control magic move the minefield before the breach is made.

On 28 August the system was given to the customer for their dry run of the exercise scenario. Contractor testing and last minute software fixes continued from 29 August through 2 September.

5.5 Dry Run Summary (Government Responsibility)

On 28 August the customer dry ran the STOWEX 96 scenario. Involved sites included the NSC, the BSC, Fort Riley, Kansas, the MWSTC and the MWTB, Fort Knox, Kentucky, the AVTB, Fort Rucker, Alabama, and the ASC at the Pentagon. The NSC acted as host and Technical Control. The BSC at Fort Riley operated BBS HICON. The MWSTC controlled blue ModSAF forces. Simulators, including SIMNETs and LRSs, from Forts Knox and Rucker were also included in the scenario dry run. The ASC site functioned as a viewport.

The customer dry run enabled all parties to observe system performance under conditions that more closely approximated those of the exercise. Although several small problems occurred and some persisted throughout the day, the dry run was successful in that all crashes were recoverable and the entire scenario was run. The contractor log for this period can be found in Appendix G.

5.5.1 Test Suite Configuration

Facilities diagrams and equipment used for the Customer Dry Run are the same as those used in the exercise. They are given in Section 5.1.

5.5.2 Events Summary

At 0730, conference calls were initiated from the NSC to all involved sites. Startup procedures were followed and the systems were initialized and brought on line. At 0800 the AGs at all sites were powered up. Fort Riley had a problem powering up their AG, resolved by removing the disk drive and hitting it to release the heads. Fort Riley's AG remained off-line, and DSI circuit problems were identified by HAI. DSI problems persisted throughout the morning activities. There was a problem initializing BBS and the phone line connections were thought to be responsible.

BBS was connected at 0958 and the test scenario was started at 1045. There were several system problems at the outset, including simulator lock-ups, Farm crashes, and IG lock ups. At least some of these problems were thought to be attributed to operator error. By 1230 OPSIN was not responding to game resume commands and a lunch break was called.

At 1300 all DSI lines were open and the game was resumed. Several problems were encountered during the afternoon, including XCIAU failure, DSI disconnects, Stealth lock-up, and BBS failure. The phone lines were again identified as the source for BBS problems.

5.5.3 Dry Run Hot Wash Summary

Main topics discussed at the Dry Run Hot Wash include the following:

1. Repeater failure caused morning BBS log-in problems.

2. Procedures Checklist (Technical Control Document) was updated and corrected.

3. Rebuilding ModSAF with BBS unpaused failed, but there is no problem rebuilding ModSAF with BBS paused.

4. Mapping problems were thought to be responsible for XCIAU crashes at Knox and Rucker - the MCLIC was not mapped properly. There were other munitions that were also improperly mapped.

5. Image Generator crashes were also attributed to mapping problems: Knox noted a crash right after firing a Hellfire.

6. There was a possible bandwidth problem noted: Rucker saw targets pop in and out.

There was a problem with the BBS dial-up lines: they would drop out and then come back on line.

The system was returned to the contractor for further test and last minute software fixes from 29 August through 2 September.

5.6 Exercise Summary

The STOWEX 96 Training Exercise was held from 3 September through 6 September 1996. Involved sites included the NSC, the BSC at Fort Riley, the MWSTC and the MWTB at Fort Knox, KY, the AVTB at Fort Rucker, Alabama, and the ASC at the Pentagon. The NSC acted as host and Technical Control. The BSC at Fort Riley operated BBS HICON. The MWSTC controlled blue ModSAF forces. Simulators, including SIMNET, AIRNET and LRSs from Fort Knox and Fort Rucker were also included in the exercise. The ASC site functioned as a viewport.

5.6.1 Objectives

The main objective for this exercise is described in the Exercise Mission of the 1st Infantry Division (M) Exercise Directive for 1st Bde Combat Team (1BCT) BBS (STOWEX) Command Post Exercise DEVIL WARRIOR 96-19, 3-6 September 1996, presented as Appendix A to this document:

"...(to conduct) a brigade level BBS driven Command Post Exercise utilizing the COBRAS Training package 3 - 6 September 1996 at the Fort Riley BSC, Fort Knox

BSC, and Fort Rucker (sic) BSC in order to prepare for its NTC rotation and support the STOWEX-A test."

The following events were scheduled for the exercise:

03 Sept	Training Day
	STARTEX 032400
4 Sept	Area Defense Execution
	Change of Mission 1 (est 041200)
	AAR #1 Change of Mission + 5 hrs (est 041700)
05 Sept	Troop Leading Time
06 Sept	LD for Deliberate Attack (est 060600)
	Change of mission #2 (est 061000)
	AAR #2 Change of Mission + 5 hrs (est 061500)
	1-34 AR index est NLT 061200
	1-34 AR Main body depart for Fort Riley at 061500
07 Sept	1-34 AR arrives at Fort Riley (est 070300) MISSION COMPLETE

5.6.2 Exercise Equipment Configuration

Facilities diagrams and equipment used for the STOWEX 96 Exercise are given in Section 5.1.

5.6.3 Events Summary

All exercise events were logged at both NSC and Fort Riley. These logs are presented in Appendix G. From a technical standpoint, the STOWEX contribution to the exercise was a success. Until the final day, when a BBS failure caused a change of focus in the exercise, the schedule was followed with a minimum of deviation. From an operational standpoint, however, the exercise was disappointing in that STOWEX did not participate in the Attack mission.

The NSC supported the exercise by functioning as Technical Control. The Fort Knox MWSTC had control of blue ModSAF. BBS HICON was located at Fort Riley. With the training audience at Fort Riley, Fort Riley was the real focus during the exercise.

The following sections address the training exercise from a Fort Riley perspective.

5.6.3.1 Performance of the STOWEX Hardware and Software Suite

With the exception of the BBS remote communication problems, the STOWEX suite performed as expected. The STRIPES 3D function was performed by an SGI ONYX borrowed from the NSC since the ICO for the Maximum Impact was not available from the vendor. The PVD, 3D and Sound Storm, located in the briefing area, generated interest particularly during the insertion of the Fort Rucker RWA simulators into the game. The STRIPES PVD and Logger was used minimally during the first AAR.

Although demonstrations and training were provided prior to the exercise, the STRIPES 3D and Unit Performance Assessment System (UPAS) capabilities were not utilized due to customer preference. The AG and XCIAU performed normally.

For the area defense portion of the training exercise prior to the change in mission, the peak local entity count was 406 entities.

Post exercise discussions with the BSC personnel indicated that there may be some additional benefit in locating a PVD in the HICON / EXCON area which, during the exercise, contained only the BBS workstation and conference telephones.

5.6.3.2 BBS Remote Communication Problems

The communication link between the BBS workstations at Fort Riley and the MicroVAXs at the NSC was dropped numerous times during the area defensive portion of the exercise. A dropping the link resulted at a minimum of an automatic re-dial by the modem to re-establish the link. If the automatic re-dial was not successful, BBS technician intervention was required. Frequently this intervention involved coordination between the NSC and Fort Riley technical personnel, removal and replacement of modems and multiplexers, and / or resetting of the BBS workstation.

These repair actions generally cleared the problem at least temporarily until the point when all efforts failed to re-establish any remote communications. Communication linking problems continued throughout the day on 9/5 with much effort expended to resolve the problems by BSC and NSC technical personnel, the Fort Riley DOIM, and the local phone company. In order to support the training exercise, the decision to revert to local BBS was made at 0245 on 9/6.

During those portions of the game when STOWEX was being used, the communication drop-outs were a distraction to personnel manning the BBS cells but the overall impact to the game was minimal due to reasonably quick repairs and the ability of the exercise control team, particularly the BBS support team, to make the problems transparent to the trainees.

It should also be noted that the communication linking problems had been previously seen by the BSC technical personnel prior to the STOWEX integration & test and exercise. BSC personnel also indicated that previous fixes involved action by the NSC technical staff.

Post exercise troubleshooting at the NSC isolated the communication problems to four coax Ethernet cables between the BBS VAXs. These cables were isolated through the use of a simplified, methodological test procedure using a single BBS system. Post exercise discussions have indicated that the problem with BBS remotes is not completely resolved.

5.6.3.3 Tactical Communications

More realistic tactical communications were provided in STOWEX 96 than in previous STOW-A exercises which utilized simple speaker phones and human facilitators. STOWEX 96 utilized standard military FM radios (RT-524s) in the Fort Riley TOCs (1-16 and 1-34). COTS hardware, RT-31 Tone Remotes and TP-8 Tone Termination Panels, provided the capability to extend the four real time, Push-to-Talk (PT~~P~~T) communication networks from the Fort Riley TOCs to the Division Response Cell at the BSC and to Fort Rucker and Fort Knox (2-34).

Although tactical communications proved somewhat difficult to establish initially, once established, the networks worked. Factors contributing to the difficulties in establishing communications included bad radios / radio mounts and unmodified RT-31s at Fort Rucker.

5.6.3.4 Exercise Issues

From the exercise log book maintained at Fort Riley during the exercise, the following exercise events / issues need to be evaluated for possible correction or improvement:

- ModSAF Crash at Fort Knox - The ModSAF front-end / back-end in OC station 12 locked-up about 0243 on 9/4. Cause is still to be determined; however, a ModSAF memory leak problem is suspected.
- Insertion of SIMNET Simulators - Preparation for inserting the vehicle and aviation simulators began 0435 on 9/4 with a request to Fort Knox and Fort Rucker that they be prepared to support a 0530 mission. Exercise control made a decision to insert the aviation simulators as scheduled while Fort Knox continued preparation. Fort Knox simulators were unable to view the exercise. The MCC was brought down and it was determined that the default exercise number was being used rather the STOWEX exercise number (exercise number 7). Fort Knox simulators were inserted into the game at 0645.
- Multiple Detonations Viewed in STRIPES 3D - A single Hellfire impacting with the ground or target was viewed as three impacts / detonations on the STRIPES 3D.
- OPSIN Crash at NSC - After discussions with Fort Rucker regarding their inability to view 155 HE detonation on the PVD, NSC identified that the OPSIN was down (0125 on 9/5). A core dump was saved and an analysis of the dump is being performed by Cambridge.

5.6.4 Pentagon Summary

The ASC hosted several key individuals observing the STOWEX 96 Exercise. In general, the briefings given by LTC Harry Thompson were very well received by both DCSOPS personnel and by the Office of the Deputy Undersecretary of the Army for Operations Research (DUSA-OR) representative. The ability to observe without

interference and with a minimum of preparation was considered a key plus. In addition, distributed simulation capability was considered to have advanced considerably since the 1994 STOW-E demonstration. Details on attendees and their comments are given below.

The ASC hosted personnel on both Wednesday and Friday, September 4th and 6th. Focus was kept on the manned simulators (both the Apaches in the Deep Attack and the M1 and M2 simulators).

Attendees at the Wednesday sessions included both Army and Air Force personnel. Herb Fallin, John Rienti, and MG Riggs were the major players from DCSOPS. Also, both Col Ruth and Col Hardin of AMSO were in attendance. Colonels Ronnie Stanfil and Fred Wall represented Air Force XOM.

LTC Thompson emphasized the value of STOW-A exercises and the changes that had occurred in the STOW-A program since the STOW-E demonstration. These included a more sophisticated and stressful training environment, a larger slice of the brigade represented, and lower costs for conducting the exercise in both personnel and equipment. He used the term "Synthetic CTC" (Combat Training Center) which was well received.

All personnel were shown both the Defense in sector and the Apache Deep Attack. MG Riggs, former commander of the Army Aviation Center and highly knowledgeable on the Fort Rucker simulation environment) was very concerned about the loss of two Apaches during the Deep Attack and actually called for a count of the number of vehicles killed in the target MRB to determine the loss exchange ratio. He was not only interested in the tactics used and the SEAD supporting the mission, but also wanted to know if we could listen into the tactical communications from the exercise (the answer was no). He said he would be very interested in seeing an Executive Summary of the exercise results and especially the unit's assessment as to whether this helped prepare them for the NTC. MG Riggs indicated that this was a big change from his past experience with large scale exercises and demonstrations in that, "Hopefully, this is now somewhat simple and transparent [to the user]. I'd rather fight a real enemy than prepare for some of the technology demonstrations we've done." However, he said, ..."the bottom line remains, what did they [the training unit] get out of it?"

On Friday, 6 September, Mr. Vern Bettancourt of DUSA-OR attended for Walt Hollis. The Air Force XOM was again in attendance as Major "Beef" Williams sat through the briefing. Mr. Bettancourt was particularly interested in the future of STOW-A and was pleased to see the scheduled transition from BBS to WARSIM as the constructive model. He was also interested in a follow-up with the unit in the March timeframe (after the NTC rotation) to see if the unit found value in the STOW-A exercise. Mr. Bettancourt also indicated that it was good to see the Guard and Active forces interacting as there were few opportunities for that to occur.

Mr. Bill Bewley of AB Technologies, a support contractor for the Defense Modeling and Simulation Office (DMSO), was also in the briefing. Mr. Bewley was a key individual in the STOW-E demonstration and his organization also played a major role in the

STOW/PW 95 demonstrations. He was very complimentary of the changes that had occurred in the system, but warned that the real test was whether the Brigade would program future STOW-A exercises. He said Capt Hollenbach of DMSO was appreciative of "real stuff." He suggested that the debriefing of the Brigade include the same questions asked of Col Dean Cash in STOW-Europe demonstration to get a comparison of the results.

Cpt Irview attended for the Army Intelligence Staff. He is a DCSINT staff officer for distributed simulation and has been involved with the Virtual Unmanned Air Vehicle (UAV) already in use at the NTC. He said that he would check out the status of the UAV system and report back to AMSO concerning the possibility of integrating it with STOW-A.

5.6.5 Post Exercise STOWEX Suite Configuration

The STRIPES PVD, Sound Storm, and the three 37" monitors (for 3D display) were reinstalled in the STOW-A work cell where the XCIAU, Logger and Maximum Impact were located for the exercise. Network checks were performed for the reinstalled systems. Installation of the Maximum Impact ICO will be performed at a future date after receipt of the hardware from the vendor. The borrowed ONYX was returned to the NSC. The RT-31s and TP-8s were to be shipped to the NSC at a later date.

5.6. 6 Technical Hotwash Summary

This section represents the STRICOM notes of the Technical Hotwash teleconference.

A STOWEX 96 Technical Hotwash was conducted on 9 September 1996 at 1500 EDT, with the NSC as the moderator. Participating sites/organizations are listed below:

Fort Leavenworth-NSC
Fort Leavenworth-BCTP OPS GP B
Fort Riley - G-3 & BSC
Fort Knox - MWSTC
Fort Knox - FXXITP
Fort Rucker - AVTB
1/211 Atk Hel Bn, Utah ARNG
STRICOM/Lockheed-Martin
Army Simulations Center

Each site/organization was requested to present three "Ups" (positive points) and three "Downs" (points that need improvement) for the exercise. The only site to rank order input was the NSC.

Fort Knox

- + Validation of synchronization of STOWEX and autonomous operations (i.e., ability to switch between STOWEX and VTP)
- + Brigade Commander and Staff (with logistics tail) made the exercise more realistic for TF 1-34 AR (than using role players)
- + The backup plan and the capability to execute training outside of STOW-A environment
- + LRS performance (from FXXITP)

- \- Standardization of HW and SW - not knowing up front what the technical architecture was
- \- SW - DED and Mapping files. Must be standardized up front.
- \- SW - Aggregation/disaggregation - ranges at which disaggregation occurred
- \- The terrain database did not match up between Constructive and Virtual (BBS disaggregated vehicle traversing NOGO terrain.
- \- Requirements need to be defined prior to exercise

Fort Rucker

- + Training benefit to 1/211. Could have been used more in the scenario.
- +/- Confusion over ModSAF RWA ROE. Used existing (in-house) ROE to overcome confusion

- \- DARPA map detail does not always come together. AVTB used ModSAF TDB different from other sites.
- \- AVTB needs equivalent to SIMNET MCC to place AIRNET entities on battlefield.
- \- Communications coordination (TAC COMMS) - resister required modification in RT-31. Once modified and established, comms were pretty stable.
- \- Entity enumeration and DED standardization

1/211 Attack Helicopter Battalion, UTAH ARNG

- + One of the best training opportunities for him and his unit
- + Real-time feedback from mission; no need to pretend or makeup.
- + Seemed to simulate "fog-of-war" well.
- + Gave feel for working with other units (e.g.. SEAD coordination)

- \- Difficulty in playing on same "gameboard" (disaggregation was controlled because of massive disaggregation potential)
- \- VTC shortfalls (lack of multi-point VTC)
- \- Limited size of playbox
- \- Confusion over the different types of targets (this relates to mapping and visualization)

Fort Leavenworth - BCTP Operations Group B

+ Training took priority over testing
+ Quick support to fix technical problems
+ Exposed many to the STOW-A "possibilities" - Subordinate units got more from it than did Bde
- Technical difficulties precluded recon on Thursday
- BBS AAR new to the team. Did not use STRIPES to fullest capability. When DIS environment went down at Riley on 6 September, so did STRIPES.
- Good database scrub with playing unit is necessary. e.g. reinforcing artillery and MLRS different than unit plan. Also, numbers of personnel and MOSs in units different than unit plan.

Fort Riley

+ Did not see significant change in personnel overhead (in BSC) by being in STOW-A environment.
+ OC team provided by BCTP
+ Contingency plans anticipated, executed and they worked.
+ TF 1-34 AR, in a STOW-A environment, receiving C2 from 1BCT

- Lack of visual architecture at each site (may have helped to diagnose/isolate problems on Thursday)
- Wednesday - unexplained loss of archived data on BBS AAR system. Data not avail for AAR. C-V environment not entirely seamless. Artificial rules for control of disaggregation (e.g. RWA)
- Quality of phone lines used for BBS remote
- 750 icon limit for BBS. Was nearly reached. Were close to that point when game went down
- Maneuver box limitation - was compressed to keep everything together.
- Tactical comms went down at inopportune times
- ModSAF Memory Leak and refresh of system - inability of brigade to maintain rhythm
- Dissemination of graphics to remote locations

STRICOM/Lockheed Martin

+ Coordination of Technical Control went very well; reduced number of personnel to run the exercise
+ Achieved goal of 500+ local vehicles on Farm during Functional Test II; Reached 406 local vehicles during exercise and could have gone higher
+ Validated implementation of structured startup/recovery and shutdown procedures.

- Unexplained OPSIN crashes (3)
- Mapping file and DED File - last minute changes
- ModSAF Memory leak required periodic refresh of system

Army Simulation Center

+ Leadership was very happy with exercise and the improvements that have been made over the past year
+ CSA wants to make a tape of the exercise for all to see.

Fort Leavenworth - NSC (in Rank Order):

+ Hub concept can support brigade level exercises
+ Found a significant reduction in personnel overhead
+ Defense Simulations Internet (DSI)

- ModSAF Memory Leak
- BBS network problems
- Data (DED) mapping

5.7 Equipment Disposition

Appendix I contains the final disposition of STOW-A equipment. This disposition provides both the NSC and the BSC with the infrastructure to conduct future exercises similar in size to STOWEX 96.

5.8 STOWEX 1.5 Baseline Management

5.8.1 Baseline Control

Baseline control is the process of ensuring authorized changes are incorporated in a given software system and are placed in a protected area to preserve the system integrity. For STOWEX 96, baseline control of OPSIN/ModSAF was the responsibility of the Software Engineers in Cambridge, MA. The management tool used is the Change Version System (CVS). The tool tracks changes and supports the development and maintenance of multiple versions of software units. All other STOW-A software was controlled in the Orlando ADST II facility. The Configuration Management issue, documented below in Section 6, describes the baseline control process that has been tailored to respond to STOWEX 96 issues and timelines.

5.8.2 Change Management

The purpose of change management is to ensure all changes are identified, implemented and documented. The first step in change management is to identify the Initial Baseline. The Initial Baseline for OPSIN/ModSAF was established as version 1.92, June 28, 1996. Refer to Section 2 for a list of Version Description Documents (VDD) for specific Initial Baseline Definitions.

As problems/deficiencies were identified, Software Review Boards were held to review the problem/deficiency. The review was chaired by the STOWEX Project Engineer. The Technical Team analyzed the implementation approach and risk factor and recommended

Action or No Action. The No Action was dependent upon the risk factor and impact to the overall system. Once an Action recommendation was issued, the problem/deficiency was written as a requirement, implemented and tested by the Software Engineer and integrated into the system. The changes are captured in the specific VDDs.

5.8.3 Summary of STOWEX 96 Discrepancy Reports

Two significant software issues emerged from the final integration efforts and the exercise. The first problem, described as an "OPSIN Hang", was documented and patched on-site after a Software Review Board decision. The following describes the problem and the temporary correction:

> Problem: OPSIN "hangs" for no apparent reason.
>
> Symptoms: Parser does not respond, OPSIN is not printing "Missed xx packets..."
>
> Diagnosis: OPSIN gets into a not quite infinite loop in the last k indexed `for' loop in cs_set_supplies(). This function calculates how much of a given supply the unit needs and distributes it across the appropriate vehicles in the unit. The distribution is done in a loop that will only exit when the remaining supplies equals zero. Unfortunately in certain yet undermined circumstances the remaining supplies starts negative which the exit criteria are not designed to work with, it also screws up the ammo distribution.
>
> Patch: Change the exit criteria for the loop to exit if remaining supplies is ever less than or equal to zero. Also add a printf to print the message "Negative remaining supplies for unit <unit name>." If the remaining supplies ever starts negative, this allows us to confirm if the problem reoccurs and that the patch has fixed it. Also is an indication that the unit in question's supplies may not be in sync with BBS and if the unit is disaggregated, steps should be taken to re-sync the unit's supplies across BBS and ModSAF.

The second problem is called the "ModSAF Memory Leak" and is characterized by a crash after the ModSAF had been running for a period of time. After the exercise was run, an analysis tool called "Purify" was run at the OSF with ModSAF 2.1 on both an SGI Indigo2 (IRIX 5.3) as a pocket, and on an R10000 (IRIX 6.2) as a Farm and PVD. The Farm consisted of 2 machines. The ModSAF scenario consisted of 4 platoons; 2 on the Farm, 2 on the pocket, and 1 fixed wing group on each. These entities remained stationary during the run. Of the 3 R10000s, 2 developed hardware problems and crashed during the weekend run. Purify reported the following errors:

1. Memory Leaks (42): Data is not freed when it is no longer needed and accumulates until all available memory has been consumed, resulting in a crash.

2. Array Bound Write/Read (8/16): Data is being written to/read from an area that has not been allocated by the software during the execution. Array Bound Write is an example of memory corruption and could cause the application to crash. With Array Bounds Read the data read may be random, and can cause random behavior or a crash. The 8 statements causing an Array Bounds Write error were called/executed 28,076,261 times. The 16 statements causing an Array Bounds Read were called 980 times.

3. Free Memory Read (4): Data is being read from a location that is no longer valid. The software has 'released' that section of memory and the data read may be random, and can cause random behavior or a crash. The 4 statements performing a Free Memory Read were called 108 times.

4. Uninitialized Memory Read (55): Data is being read from a location that was never initialized. If the data was not initialized before it is used it can introduce a more severe error, such as those stated above. The 55 statements causing the Uninitialized Memory Read were called a total of 4,002,018 times.

Additional testing is recommended for this problem, to include rigorous testing of ModSAF under a system load of at least 150 local entities on each of the ModSAF workstations for at least 2 hours.

In addition to the software problems, the following problems were also identified during the exercise support activities:

- The version of ModSAF compiled for 6.2 was not reliable. Since IRIX 6.2 was a newly delivered operating system, there was not sufficient time to compile and test in the OSF prior to shipment. Attempts to compile on site were unsuccessful. Since the reliable 5.3 version executed on the 6.2 machines, the compilation effort was deferred until post-exercise. The effort is being tracked until completion, including verification.

- Mines. There seemed to be no effective method for blue vehicles to breach red minefields. A Grizzly following a MCLIC was frequently destroyed by mines trying to make the breach. Also, breaching minefields caused the M1 and M2 simulators to crash. Changing the mine type in the red minefields had no beneficial effects. The development of workarounds during site testing is a difficult task unless personnel who are familiar (experienced users and/or developers) are present. For example, the use of the Grizzly vehicle or MICLK to clear the minefield did not provide the expected results since the Grizzly proved extremely vulnerable to the mines. Alternative methods, such as deleting or removing the minefield, often caused the ModSAF Farm to crash. Further investigation is required to identify the requirements against which the minefield and breaching functions were built to determine whether they performed in accordance with Engineering School doctrine. Results must then be discussed

with the STOW-A user community to (a) agree upon an acceptable behavior during an exercise or (b) develop one or more workarounds in an environment where the outcome can be predicted and tested. This issue relates to both the Requirements issue and the Planning Time issue documented below in Section 6.

Post-exercise activities include the evaluation of the test log to identify issues, such as the dead hulk problem, that will be written, dispositioned, and tracked.

5.9 Risk Mitigation

The SGI Impact Channel Option (ICO) that enables the Maximum Impact to drive more than one monitor was a production problem for SGI. Two risk mitigation plans were devised. The first was to procure a cable that connected the 13W3 Impact to a single RGB 37" monitor. The second plan included borrowing a loaner Onyx from different sources. The first method was employed.

The newly announced R10000 processors procured for OPSIN and the ModSAF Farm also presented a risk. The R10000 were prone to failure and have been recalled and in the process of being replaced. Therefore, several spare machines were sent to the NSC for back-up.

6.0 STOWEX 96 Issues and Recommendations

There were 7 major issues identified during STOWEX 96. These are:

1. Improved control of the DSI
2. Earlier completion of vehicle mapping across simulation platforms
3. Earlier availability of exercise control information
4. Definition of requirements and design
5. Configuration management
6. Planning time
7. Technology advancement

6.1 DSI Issue and Recommendation

Issue: Connectivity testing was performed prior to the actual exercise testing. The connectivity test showed that all IP and stream connections were up and available for use. Defense Simulation Internet (DSI) problems began when actual simulation traffic was generated and transmitted over the network. ~~Although specific testing of the long haul data communications was performed well in advance of the exercise, problems were encountered during the week prior to the exercise when all long haul sites were integrated.~~ The most obvious symptom was the inability of Fort Rucker to receive the proper entity count at the AG. The troubleshooting that ensued included extensive conversations with HAI. The following problems were experienced.

1. ~~HAI's new "Dual Homing" software imposed a bandwidth penalty due to additional software overhead. Since b~~Initial bandwidth allocations for each site had been ~~allocated~~ set based on PW95 experience.~~,~~ When the entity count problem occured, ~~the reduced bandwidth availability resulted in entity drop out at Fort Rucker.~~ b~~B~~andwidth allocations were reduced for ASC and Fort Riley since these sites would not be generating network traffic (final allocations documented on page G-101). During periods when STOW functional testing was not being performed, HAI worked to improved the ~~bandwidth (reduced the software overhead).~~ problem. Subsequent information from HAI indicates that there was a "bad" T1 link (suspect that a service provider had misconfigured or attached some additional component to the link).

2. Router configuration problems at Scott resulted in an excessive number of sites being assigned to a single processor. This configuration problem was resolved.

3. HAI could not provide routing through Scott which was required for Fort Rucker's "Dual Homing" channel. While the lack of the second / redundant channel

prevented conducting the exercise simultaneously with VTC, the exercise itself was not impacted. This routing problem was never resolved by HAI.

4. During functional testing, coordination / communication problems between HAI personnel on different work shifts would result in the HAI night shift changing network configurations that functioned during the day. Not only were the changed configurations were unusable by the STOW team at the beginning of the day, the day shifts were unaware that the changes had been made.

Recommendation: The test plans properly identified the need to perform the connectivity test very early in the test schedule. Unfortunately for STOWEX 96, resolution of the problems with HAI consumed far more time than planned. Recommendation is to continue planning for early DSI testing with network loads simulating expected exercise conditions. ~~Although, an HAI representative was eventually included in the daily technical control conference calls, inclusion from the start of testing would have been beneficial.~~ In order to avoid numerous personnel at HAI providing inconsistent support, a subcontract with HAI for one exercise support engineer is warranted. The exercise support engineer should be required to remain on a teleconference during the functional tests and exercise. If additional equipment is required to provide dual homing capabilities, installation should be performed sufficiently early to allow for testing of the exercise network with actual exercise traffic.

6.2 Mapping Issue and Recommendation

Issue: Final mapping was performed late in the integration and test phase and affected the test events. For STOWEX 96, vehicle types, weapon systems and munitions types were identified or could be derived from the Exercise Directive and TOE prior to the exercise. Based on the difficulties with mapping, this information is needed as early in the program as possible to support testing. In addition, information that supports the development of test scenarios that will stress the system in the same manner as the one(s) to be used in the actual exercise are required to support test program (terrain data base testing, mapping verification, load testing, STRIPES initialization, etc.). Information that will be needed includes:

- List of vehicle types,
- Unit designations,
- Initial task organization,
- Real world map of the play box,
- Operation overlays or at a minimum, a listing of control measures with grid coordinates,
- Definition of mission with connections to control measures,
- Simulator IDs by TOE position and initial locations in the gaming area.

Resolution: The identification of all vehicles and ammunition to be used in the actual Exercise must be agreed upon and made available to the Contractor during the design and development phase in order to establish mapping tables. The scenario to be used during the Dry Run and the Exercise must be provided to the Contractor prior to OSF testing in order to test the mapping and resolve mapping issues in a timely manner. This resolution also falls under the recommendation of an Exercise Control Plan, Issue 6.3.

6.3 Exercise Control Information Issue and Recommendation

Issue: The STOWEX 96 Delivery Order originally contained a requirement for the Contractor to deliver an Exercise Control Plan. This requirement was reallocated from the Contractor to the Government. The plan was not received in time to support many of the technical activities. As a result, none of the testing was performed against the exercise scenario. Vehicle and ammunition mapping was accomplished on site rather than during the design and development phase and tested against Contractor developed scenarios. The final mapping issues were not identified until after the true exercise scenario was provided at Dry Run. The decision to have a ModSAF red air attack contingency at the NSC was made during final integration and not clearly communicated to all parties.

Other issues that would typically be defined in an Exercise Control Plan include the identification and allocation of roles and responsibilities. While most roles and responsibilities were explicitly or implicitly understood, some (such as responsibility for training site personnel on usage and maintenance of STOW-A equipment) were not identified until the Exercise Dry Run. The need and responsibility for developing a test scenario for Blue ModSAF would have been identified early. An agreed-to list of stations to be staffed and the resulting responsibilities would identify scope issues and establish assignments in advance. Responsibilities and procedures for voice communication networks would be established earlier. The availability of all sites to support multiple shift activity must be identified in advance.

Recommendation: The Contractor should develop, as a minimum, an exercise control checklist in order to ensure that critical items are being addressed in sufficient time to reduce program risks. Appendix J provides a recommended outline and a generic planning timetable that starts 6 months prior to the exercise. Even if this is not a deliverable document, it identifies the planning activities that the Contractor must undertake and the inputs that must be solicited from the Government. This outline is based upon previous plans that have guided successful exercise results.

6.4 Definition of Requirements and Design Issue and Recommendation

Issue: In order to provide a baselined STOW-A infrastructure, a comprehensive requirements and design effort must be performed and documented. This task includes the definition of operational concepts performed in concert with the Government either from SOWs, technical interchanges, or derived from the Contractor's understanding of Government objectives. Comprehensive requirement statements must be developed to

include not only the descriptions of existing "as-built" functionality but also the perceived and, ultimately, the agreed-upon objectives against which the system must be developed, rather than the verbal goals that may be verbalized over time but not specified.

Recommendation: Appendix K presents an initial set of system and subsystem requirements for STOWEX 96. These requirements are not complete and currently reflect an as-built set of capabilities rather than the statements of known customer specifications and constraints that are either provided or derived through analysis from experience, technical interchanges, and related documentation. A thorough requirement analysis effort should be performed in order to provide a complete set of STOWEX specifications in the future. Once requirements have been developed and approved, the allocation of those requirements to a STOW-A design can be performed and documented in a manner similar to Section 4 of this document, leaving the program with a clear definition of the hardware and software required for the infrastructure. Once this baseline is established, exercise specific items can be addressed and site-specific architectures easily developed.

In addition to functional and performance requirements, other requirements such as Training, Shipping, and other procedural requirements that are not accomplished by hardware or software must be developed. In the future, for example, shipping requirements must be identified well in advance particularly when the equipment is to be permanently transferred to the receiving sites. In addition, if overseas delivery is required, additional logistical constraints must be identified and planned for (i.e., transoceanic vs. air shipment, customs issues, etc.). Training requirements for all new STOW-A equipment added to each STOW-A site must also be identified. For example, Fort Riley technicians need to be trained on the operation and maintenance of SGI equipment. Providing start-up and shut-down procedures is necessary, but operational familiarity is mandatory. During the Government conducted Dry Run, the Riley AG would not boot until the hard drive had been removed and manipulated until the heads released. This was identified via teleconference with Technical Control at the NSC, but should have been performed by the BSC site contractor.

6.5 Configuration Management Issue and Recommendation

Issue: The purpose of change management is to ensure all changes to hardware and software are identified, implemented and documented. The following four issues were identified during STOWEX 96.

The first issue pertains to software developed and maintained by subcontractors. Even though ADST II has in place a Configuration Management Plan, some subcontractors may not. Subcontractors maintain and develop their software and do not necessarily in a implement an adequate configuration management process. The STOWEX 96 team brought the source code and data files under the ADST II Configuration Management process and the team requested on-site support for the software from the subcontractor.

This enabled the STOWEX 96 team to control and track the changes being incorporated into the baseline.

The second issue pertains to off-site configuration management process. It is a challenge to maintain configuration management process at multiple sites and with multiple versions. However, the STOWEX 96 team maintained logs of observations, happenings and changes. These logs were used in creating the Version Description Documents.

The third issue pertains to changing the software or data files prior to the exercise and then sending the same updated software or data files to the other sites. Changes are inevitable. As changes were incorporated, the STOWEX 96 team quickly recognized that the software at all the sites must be the same for successful training. The team copied the updated software onto tapes and mailed the tapes with an overnight delivery to the appropriate sites. It was helpful to engineering support in Orlando to support the software efforts.

The last issue pertains to hardware configuration. The hardware at the simulation sites were installed prior to a training exercise. As additional hardware arrived, the configuration of the system was modified prior to the exercise by the addition of memory and internal harddrives. The STOWEX 96 team was quick to respond to re-configure the hardware system as the additional equipment arrived. The documentation of the hardware configuration, although known, was not fully captured until final reporting effort.

Recommendation: Recommendations include improving the STOW-A Configuration Management Process by:

1. Placing the subcontractors' source code into the ADST II Configuration Management control,

2. Placing all source code, excluding the BBS software, into the ADST II Configuration Management control and during development, placing the main components into the STOW-A configuration control at OSF, since most changes/development will be at the OSF,

3. Having an on-site configuration control engineer during the pre-exercise phase to capture changes, control software and update other sites as applicable,

4. Having the on-site configuration control engineer to capture initial hardware baseline at the site and at the end of the pre-exercise/exercise.

6.6 Planning Time Issue and Recommendation

Issue: The time between contract start and the beginning of a STOW-A exercise is never sufficient to perform the detailed planning required to design and develop/procure and test the STOW-A systems.

Recommendation: The development of a reusable Exercise Control Plan and a Requirements and Design Document for STOW-A will baseline the activities required by all exercise developers and participants as well as the "typical" STOW-A "product." Streamlining of all engineering activities, consistency of implementation, and repeatable processes are mandatory to achieve the efficiency required in the short schedules of STOW-A exercises

6.7 Technology Advancement Issue and Recommendation

Issue: The advancement of technology is such that new products are announced, on the average, every 18 months. This causes rapid obsolescence of expensive equipment recently procured and delivered to STOW-A sites. In addition, equipment bought for the development laboratory environment should be the most recent available; instead, it is frequently the oldest that has been bought by the program. The program also runs the risk of buying immature technology and defining/developing new interfaces if the most newly announced systems are procured. The risk associated with technology advancement ties back into the requirement definition issue. The equipment currently fielded satisfies the exercise goals today, i.e., supporting brigade level exercises with anticipated virtual entities in the 500 number range. If the requirement for larger numbers is specified in the future, improvements in hardware, software, and/or system configuration must be addressed.

Appendix A

STOWEX 96 Exercise Directive

Appendix B

STOWEX 96 Site Survey Checklist

- Facilities
  - Floor Plan / Layout
  - Furniture
    - Desks / table
    - Chairs
    - Stand / cart / shelving for large screen Stealth monitors (37")
  - Power
    - Facilities power
      - Power Distribution
      - Outlet Connectors
    - Power strips, surge protectors
  - Network Support
    - DSI node
    - T20
    - Video Teleconferencing (VTC)
  - Telephone Support (Quality, Quantity, Location)
    - Voice (Exercise / Technical Control, Administrative, etc.)
    - Data (BBS Remotes)
    - Fax
- Equipment / Software
  - Local Area Network
    - Ethernet (10 Base T) hubs
    - Ethernet Transceivers
      - 10 Base T
      - Thinnet
      - Fiber optic
    - Cables
      - 10 Base T
      - Thinnet
      - Fiber optic
      - Audio (SoundStorm)

- Telephone
  - Voice Hardware
    - Telephones - conference call capability
    - Telephone headsets
  - Dial-up Hardware Support
    - Mux'es
    - Modems
  - FAX Machine
- Computers / Workstations (class of SGI machine, RAM, hard drive size, # of Ethernet ports)
  - COTS
    - AG
    - XCIAU
    - Logger
    - OPSIN
    - STRIPES (PVD)
    - STRIPES (3D)
    - ModSAF (Blue and Red Forces)
  - GFE
    - BBS
      - HICON, Friend, Enemy
      - See-All
      - AAR
- Data Storage
  - 4mm DAT Tape Drive
  - QIC Tape Drive
  - 9GB Disk Drive
  - CD-ROM Drive
- Software
  - Machine Software Configuration
    - Operating System
    - NFS
    - Ethernet Driver (AG, XCIAU, OPSIN)
  - COTS Software Tools
    - SGI IDO
    - SGI C++
    - Internet Suite
      - FTP
      - e-mail
    - Purify
    - Network Analysis Software
  - GFE Application Software
    - AG
    - XCIAU

- STRIPES
  - Logger
  - PVD
  - 3D
- ModSAF
- OPSIN
- BBS

- Other Hardware
  - Stealth monitors
  - Sound Storm
  - Remote monitor
  - Video distribution amplifier (VDA)
- Other Software
  - SIMNET / AIRNET Simulators
    - Mapping Files
    - DED Files
- Tools and Test Equipment
  - Network Analyzer
  - Cable Tester
  - Crimper

Appendix C

Mapping

The visual models for the SIMNET simulators are stored in a dynamic element database (DED). Each DED provides several models, each with a database unique entity ID. This ID is used by the simulation to display a particular model. Mapping files are used to identify which DED entity should be displayed. The SIMNET simulators utilize three mapping files to identify the correct visual models to display. These files are: the vehicle mapping file, the ammo mapping file, and the "asid" mapping file.

The vehicle mapping file is used to map the SIMNET protocol vehicle type enumerations to the appropriate visual model in the DED. The ammo mapping file is used to map munitions special effects, by munition type, to firing and detonation events within the simulation. The asid mapping file appears to be for holding offsets for vehicle special effects, like smoke, flames, and bumper numbers, to a displayed visual model.

In support of the STOWEX 96, there was a need to generate a new vehicle mapping file for the SIMNET Stealth, M1, and M2 simulators. The "standard" SIMNET ammo mapping file and asid mapping file were used. The mapping effort reflected the following:

VEHICLE MAPPING FILE:

1. The mapping files are very sensitive. The mapping files are system sensitive and have to be oriented correctly. A mapping file on and M1 may not work on M2 and the same for a file on a M2 to a M1. Also, if you transfer a mapping file using FTP from site to site, make sure that you are in ASCII mode. If you transfer in binary mode you may pick up certain control characters that will crash the M2s. (This has to do with the butterfly vs. MassComp vs. 147 hosts).

2. The file is separated into several sections or "classes" of vehicles such as "armored_tracked" or "towed". Each vehicle, as identified by its SIMNET

enumeration, must be placed in its appropriate class. The ModSAF header file "veh_type.h" contains the definition of vehicle types including their "class".

3. If entries (as defined by their vehicle number) are not in their "class", it appears that the SIMNET simulators will crash.

4. If entries are in the correct class, the order of the entries will not matter. It is important that the vehicles be in the correct class or the system will crash.

5. The first three entities in each section or "class" are the default entries for the class. The first one is the "other" default. The second one is the "US" default. The third is the "USSR" default. The vehicle number is not important for these entries.

6. Butterfly systems require another printable ASCII character between the comment hash mark, "#", and the end of line. Because of this, "blank line" comments should consist of "# *" instead of just "#". Note that blank lines are acceptable.

7. All of the classes must be in the reader file, otherwise the application will not boot.

8. The ModSAF "constants.rdr" file contains the SIMNET enumeration for all of the entities simulated by ModSAF.

9. The ModSAF entities directory contains the rdr files for all of the ModSAF simulated entities. In each of these files, a single line identifies the guises for the entity. This line must have two entries, a nominal guise and an alternate guise. The guises identify the constants placed in the data PDUs. If the second guise is not in place, the SIMNET simulators will crash in alternate mode.

10. There are many errors in several ModSAF rdr files. STOWEX looked at the ModSAF entities files and the constants files and found several errors.

11. A typical entry in the vehicle mapping file needs to look like:

```
START_VEH_ENTRY
vehicle          28820802
appearance_mask  0
appearance       0
cig_veh_type     43
destroyed_type   50
END_VEHICLE_ENTRY
```

12. The vehicle number and the appearance mask fields are in hexadecimal. The rest of the fields are decimal. Note that the IG generated DED listings give the model numbers in hexadecimal.

13. The appearance mask field is a mask to allow the use a different visual models for different appearance enumerations.

14. The appearance field should be 0 (zero) unless some other information becomes available.

15. The IG vehicle type and the destroyed type fields contain the DED entry id for the "live" and "dead" model respectively.

16. Case does not appear to be important, at least in the hexadecimal vehicle and appearance mask entries. The convention for each entry appears to be uppercase for the "class" headers, including the start and end vehicle entry headers, and lower case for the entry names.

17. Missiles are entities and therefore their visual representation is in the DED; their mapping needs to be in the vehicle mapping file under the missiles section. Note that muzzle flashes, detonations, etc. for all munitions including missiles, are contained in the ammo mapping file.

18. The beachball is the standard default model built in the DED. The flames and the smoke are special effect also built in the DED. In addition to the beachball standard, there are DEDs without flames and smoke. (Supposedly, the Chodo DED was built with an M1 as the default model instead of the beachball.)

AMMO MAPPING FILE:

1. The ammo mapping file maps muzzle flash and detonation visual effects (from the DED) for all munitions including ballistics and missiles. Note that ballistic munitions do not have any visual representation other than a muzzle flash and detonation while missiles are represented as entities (both visually and in PDUs).

2. The ammo mapping file typically does not need to be modified. Most DEDs have the "standard" special effects entries.

3. Note: STOWEX had to put new entries into the XCIAU "enttype.tbl" to translate "unknown" artillery detonations into HE detonations so that they could be "seen" by the O/Cs.

ASID MAPPING FILE:

1. Appears to hold the offset for vehicle special effects such as smoke, muzzle flash, flames, etc.

SIMDO vs CHODO DED Files:

The SIMDO DED file, which is the default DED, was generated and delivered with the SIMNET systems. SIMDO contains approximately 50 models. The CHODO DED file, which was generated to support training in Korea (Chorwon database), contains 17 models. Different DED files can be loaded into the image generator to meet different training needs.

Prior to the STOWEX mapping task, the contractor's recommendation to use CHODO was made and agreed upon since this DED file had also been used during Prairie Warrior 95. As indicated elsewhere in this section, the mapping testing task indicated problems with OPFOR Rotary Wing Aircraft (RWA). Vehicle mapping files used in conjunction with the CHODO DED file provided an OPFOR RWA that visually appeared as an AH-64 for one type of OPFOR RWA and visually appeared as OPFOR ground vehicles for two other types of OPFOR RWA's. In an attempt to overcome the lack of a suitable OPFOR RWA, the CHODO DED replaced a version of SIMDO available at Fort Knox. While this version of SIMDO may have provided a better model for OPFOR RWA, it invalidated the mapping test previously conducted.

Table C-1 3D Blue Ground Vehicle Model Mapping

ModSAF 3D Model	Stealth 3D Model	SIMNET M1	SIMNET M2	Color
Avenger	HMMWV	HMMWV (TOW)	HMMWV	brown
HMMWV	HMMWV	HMMWV (TOW)	HMMWV	brown
Outrider	HMMWV	Cargo HEMMT	Truck-Friend	brown
NLOS	HMMWV	HMMWV (TOW)	HMMWV	brown
GBS FAAD	HMMWV	HMMWV (TOW)	HMMWV	brown
M1	M1	M1	M1	brown
M1 CPS	M1	M1	M1	brown
M1A1	M1	M1	M1	brown
M1A2	M1	M1	M1	brown
AVLB	M113	M113	M113	brown
Grizzly	M113	M113	M113	brown
M2	M2	M2	M2	brown
M3	M2	M2	M2	brown
M3A3	M2	M2	M2	brown
LOSAT	M113 w/RL	M113	M113	brown
Stingray	M2	M2	M1	brown
M2 Stinger	M2	M2	M2	brown
M102	M109	M109	Self Propelled	brown
M106A1	M106	M106	M106	brown
M1064	M106	M106	M106	brown
M109	M109	Self Propelled	Self Propelled	brown
M109A1	M109	Self Propelled	Self Propelled	brown
M109A3	M109	Self Propelled	Self Propelled	brown
M109A5	M109	Self Propelled	Self Propelled	brown
M109A6	M109	Self Propelled	Self Propelled	brown
Crusader SPH	M109	M1	M1	brown
Crusader RSV	HEMMT	HEMMT	CARGO TRUCK	brown
Crusader M977	HEMMT	HEMMT	CARGO TRUCK	brown
M113 Ambulance	M113A2	M113	m113	brown
M113 Engineer	M113A2 w/ M105 trailer	M113	M113	brown
M113 Observer	M113A2	M113	M113	brown
M198	M109	Self Propelled	Self Propelled	brown
M270	MLRS	M113	MLRS (M113)	Lt green
M270 GAT2	MLRS	M113	MLRS (M113)	Lt green
M270 M26	MLRS	M113	MLRS (M113)	Lt green
M577A1	M577A1	M113	M113	black
M88	M88	M88	M88	brown

M977	HEMMT	HEMMT	Cargo HEMMT	brown
M978	HEMMT	HEMMT	Cargo HEMMT	brown
M979	HEMMT	HEMMT	Cargo HEMMT	brown
M981	M113 w/RL	M113	M113	brown
M992	M113	M113	M113	brown
XM8	M1	M1	M1	brown
M35A2 FDC	M985 HEMTT	HEMMT	HEMMT	brown

Table C-2 3D Blue Aircraft Vehicle Model Mapping

ModSAF 3D Model	Stealth 3D Model	SIMNET M1	SIMNET M2	Color
US UAV	US UAV	A-10	A-10	Lt green
A10	A10	A-10	A-10	green
F14D	F14	A-10	A-10	gray
F16D	F16	A-10	A-10	brown-green
AH64	AH64	AH64/RAH66 Longbow?	AH64/RAH66 Longbow?	green
AH64D	AH64	AH64/RAH66 Longbow?	AH64/RAH66 Longbow?	green
RAH66	RAH66	AH64/RAH66 Longbow?	AH64/RAH66 Longbow?	dark
RAH Longbow	RAH66	AH64/RAH66 Longbow?	AH64/RAH66 Longbow?	dark
OH58D	OH58	AH64/RAH66 Longbow?	AH64/RAH66 Longbow?	black

Table C-3 3D Red Vehicle Model Mapping

SECTIONS	Stealth 3D Model	Color
LOSAT Section	LAV25 (nothing)	
Crusader Section	nothing	

Table C-4 3D Platoon Model Mapping

PLATOONS	Stealth 3D Model	Color
Avenger Platoon	HMMWV	brown
M1 Platoon	M1	brown
M1A2 Platoon	M1	brown
LOSAT Platoon	Nothing (LAV 25)	
M2 Stinger Platoon	M2	brown
M3 Platoon	M3	brown
M3A3 Platoon	M3	brown
M3 Scout Platoon	M3	brown
XM8 Platoon	M109 (XM8)	green
Crusader Platoon	Radio	
Crusader LRP	Radio, HMMWV,HEMMT	brown

Table C-5 3D Company Model Mapping

Company	Stealth 3D Model	Color
M1 Company	M1	brown
M1A2 Company	M1	brown
LOSAT Reinforced M2 Co	4 radio, 14 M2, 4 M1	brown
M2 Reinforced Company	18 M2, 4 M1, 4 Infantry	brown green
Blue Mech Heavy Co	8 M2, 4 M1, 8 Infantry	brown green
Blue Tank Heavy Co	4 M2, 8 M1, 4 Infantry	
Armored Cav Troop	A little of everything	

Table C-6 3D Red Ground Vehicle Model Mapping

ModSAF 3D Model	Stealth 3D Model	SIMNET M1	SIMNET M2	Color
BM21	BM21 Rocket Launcher	BMP	BMP	brown
BMP1	OK	BMP	BMP	brown
BMP2	OK	BMP	BMP	brown
BRDM2	OK	BMP	BMP	brown
BTR60PU	OK	BTR	BTR	brown
BTR80	OK	BTR	BTR	brown
SA9	OK	BRDM	BRDM	brown
SA15	OK	BRDM	BRDM	brown
T72M	OK	Tank	Tank	brown
T80	OK	Tank	Tank	brown
URAL375C	Truck	Truck	Truck	white
URAL375F	Truck	Truck	Truck	white
ZIL131 FDC	Truck	Truck	Truck	white
ZSU23-4M	OK	ZSU	ZSU	green
1V13	OK	BRDM	BRDM	brown
1V14	OK	BRDM	BRDM	brown
1V15	OK	BRDM	BRDM	brown
1V16	OK	BRDM	BRDM	brown
2B11 (2S11)	2B11 (BMP)	BRDM	BRDM	brown
2S12	OK	Self Propelled	Self Propelled	brown
2S1	OK	Self Propelled	Self Propelled	brown
2S6	OK	Self Propelled	Self Propelled	brown
2S19	OK	Self Propelled	Self Propelled	brown

Table C-7 3D Red Aircraft Vehicle Model Mapping

ModSAF 3D Model	Stealth 3D Model	SIMNET M1	SIMNET M2	Color
USSR UAV	SU25	FWA	FWA	brown
MIG 27	OK	FWA	FWA	brown
MIG 29	OK	FWA	FWA	dk blue
SU25	SU25	FWA	FWA	brown
Mi 8	Hind-D	ATK HELO	?	brown
Mi 24	OK	ATK HELO	?	brown
Mi 28	Mi 28	ATK HELO	?	brown
KA 50	KA 50 (Hind-D)	ATK HELO	?	brown

Table C-8 3D Vehicle Model Mapping, DIS Simulators

ModSAF	ARSI	Dial-a-Tank	RCVS HMMWV	RCVS 577
avenger		hmmwv	hmmwv	Q36 Radar
HMMWV	hmmwv	hmmwv	hmmwv	hmmwv
outrider		hmmwv	hmmwv	hmmwv
nlos		hmmwv	hmmwv	??
GBS FAAD		hmmwv	hmmwv	??
M1	M1	M1	M1	M1
M1 CPS	M1	M1	M1	M1
M1A1	M1	M1	M1	M1
M1A2	M1	M1	M1	M1
AVLB		M113	M113	M1
GRIZZLEY		M2/M3	??	??
M2	M2	M2	M2	M2
M3		M2	M2	M2
M3A3		M2	M2	M2
LOSAT		M113	M113	??
STINGRAY		Truck	M2	M2
M2 STINGER		M2	M2	??
M102		Truck	Rkt Lchr	Rkt Lchr
M106A1	ENTITY MARKER	M113	M113	M113
M1064		M113	M113	M113
M109	TRACKED VEH.	MLRS	MLRS	??
M109A1	TRACKED VEH.	MLRS	MLRS	??
M109A3	TRACKED VEH.	MLRS	MLRS	??
M109A5	TRACKED VEH.	MLRS	MLRS	??
M109A6	TRACKED VEH.	MLRS	MLRS	??
CRUSADER SPH		Truck	Truck	Truck
CRUSADER RSV		M977	M977	M977
CRUSADER M977		truck	M977	M977
M113 AMBULANCE	M113	M113-AMB	M113-AMB	M113-AMB
M113 ENGINEER	M113	M113	M113	M113
M113 OBSERVER	M113	M113	M113	M113
M198		MLRS/109	MLRS/109	??
M270	TRUCK	MLRS	MLRS	MLRS
M270 GAT2		MLRS	MLRS	M271
M270 M26	TRACKED VEH.	MLRS	MLRS	M273
M577A1	M577	M577	M577	M577
M88A1	ENTITY MARKER	M88	M88	M88
M977		Cargo Hemmt	M977	M977
M978		Fuel Hemmt	HEMMT	HEMMT
M979		Cargo Hemmt	Cargo Hemmt	??
M981		FIST-V	M113	M113
M992		M113	Cargo Hemmt	M113
XM8		M1	M1	??
M35A2-FDC	M35 Truck	Truck	Truck	Truck
USUAV		A10	UAV	UAV
A10	A10	A10	A10	A10
F14D		F14	F14	F14

F16D		F14/Twin Tail	F16	F16
RAH66		AH64	AH64	??
AH64		AH64	AH64	AH64
AH64D		AH64	AH64	AH64
RAH 66 LONGBOW		AH64	AH64	??
OH58D	OH58	AH64	AH64	??
BM21	ENTITY MARKER	Truck	Truck	Tank
BMP1		BMP	BMP	BMP
BMP2	BMP	BMP	BMP	BMP
BRDM2	BMP	BRDM	BMP	BMP
BTR60PU		BMP	BMP	BMP
BTR80		BMP	BMP	BMP
SA9	Towed Missile Launcher	BMP	BMP	Tank
SA15		BMP	BMP	Tank
T72M	Tank	Tank	Tank	Tank
T80	Tank	Tank	Tank	Tank
URAL375C	Truck	Truck	Green Hemmt	Truck
URAL375F		Truck	Green Hemmt	Truck
ZIL131_FDC		Truck	Tank w/bumper#	Truck
ZSU23_4M		ZSU	Tank w/ZSU	Tank w/ZSU
1V13		BMP	BMP	BMP
1V14		BMP	BMP	BMP
1V15		BMP	BMP	BMP
1V16		BMP	BMP	BMP
2B11 (S211)		BMP	BMP	Tank
2S12		BMP	BMP	Tank
2S1	ENTITY MARKER	BMP	BMP	Tank
2S6		BMP	BMP	Tank
2S19		BMP	BMP	Tank
USSR UAV		FWA-Single Tail	SU25	A10
MIG27		FWA	FWA-Twin Tail	FWA-Twin Tail
MIG29		FWA	FWA-Twin Tail	FWA-Twin Tail
SU 25		FWA-Single Tail	SU25	A10
MI 8	HELICOPTER	HELICOPTER	HELICOPTER	HELICOPTER
MI 24		Atk Helo	Atk Helo	Atk Helo
MI 28		Atk Helo	Atk Helo	Atk Helo
KA 50		Atk Helo	Atk Helo	Atk Helo
500 lb		yes	yes	yes
4.2 Mtr		yes	yes	yes
2000lb		yes	yes	yes
105 mm How		yes	yes	yes
155 mm How		yes	yes	yes
MICLIC		yes	yes	yes
165 HEP		yes	yes	yes
MLRS		yes	yes	yes
Smoke - WP		Saw explosion	Saw explosion	Saw explosion
Smoke - HC Red		Saw explosion	Saw explosion	Saw explosion

Flare - Parachute		No	No	No

Table C-8 3D Munitions

Munition	Stealth	M1 SIMNET	RCVS	DAT
2000 Bomb	No	No	yes	yes
500 Bomb	Yes	Yes	yes	yes
M548	Yes	No	yes	yes
4.2 Impact	Yes	Yes	yes	yes
4.2 Proximity	Yes	Yes	yes	yes
155 Impact	Yes	Yes	yes	yes
155 Proximity	Yes	Yes	yes	yes
165 HEP	No	No	yes	yes
MLRS	Yes	Yes	yes	yes
MICLIC	Yes	No	yes	yes
Bridge Remote Detonation	Yes	Yes		
WP Smoke M110E	No	No	yes	yes
WP Smoke M825	No	No	yes	yes
M76 IR Smoke	No	No		
L8A1 RP Smoke	No	No		
M18HC - Red	No	No		
M18HC - Green	No	No		
M18HC - Yellow	No	No		
M18HC - Violet	No	No		
TOW	Yes	Yes	Yes	Yes
Songster	Yes	Yes	Yes	Yes
Hellfire	Yes	Yes	Yes	Yes
Sagger	Yes	Yes	Yes	Yes
Spandrel	Yes	Yes	Yes	Yes
Gaskin	Yes	Yes	Yes	Yes
Gauntlet	Yes	Yes	Yes	Yes
Stinger	Yes	Yes	Yes	Yes
SA19	Yes	Yes	Not Tested	Not Tested
SA6	Yes	Yes	Not Tested	Not Tested
MK82	Yes	Yes	Yes	Yes
Maverick	Yes	Yes	Yes	Yes
Sidewinder	Yes	Yes	Not Tested	Not Tested
AT-6	Yes	Yes	Yes	Yes

Appendix D

COMMUNICATION USERS GUIDE

VOICE COMMUNICATION

CONFERENCE CALL INSTRUCTIONS

General. Ten-way conference calls are initiated from the NSC's STOW-A Exercise Control / Technical Control area on either the Exercise Control line (913) 684-8312 or the Technical Control line (913) 684-8370. Other telephone extensions may be activated for 10-way conferences be calling the DOIM POC Neal Sleeve (684-7009) or Diana Stanton (684-4567). When all parties are connected, switch to hands-free / speaker mode and continue the conference. Hang up to end the conference and disconnect all parties.

To Initiate a Conference Call

Action	**Response**
1. Pick up the handset or set to hands-free mode.	Dial Tone
2. Dial the conference call Access Code: *72	Special Dial Tone
3. Dial the telephone number of the conferee	Ringback tone
4. Conferee answers	
5. Press flash once	
6. Dial the conference call Access Code: *72	Conference

Adding Additional Conferees

1. Press flash once	
2. Dial the telephone number of the conferee	Ringback tone
3. Conferee answers	
4. Press flash once	
5. Dial the conference call Access Code: *72	Conference

Repeat for all additional conferees up to a maximum of 10 total conferees (9 remotes and the originating telephone extension.

The STOWEX Technical Control personnel will initiate the Exercise Control and the Technical Control calls daily per the published schedule.

TELEPHONE DIRECTORY

Exercise Control Numbers

Fort Riley BBS HICON	98-(913) 784-5796	PIN 992920
Fort Riley XCIAU	98-(913) 239-1514	PIN 992920
Fort Rucker	98-(334) 598-3066 ext 251	PIN 992920
Fort Knox	98-(502) 624-3667	PIN 992920
Fort Knox LRS	98-(502) 942-5633	PIN 992920
Army Simulation Center	98-(703) 697-5190	PIN 992920

Technical Control Numbers

DSI NCC	99-(913) 758-1358	PIN 992920
Fort Leavenworth AG	98-(913) 684 8370	PIN 992920
Fort Riley AG	98-(913) 239 1290	PIN 992920
Fort Riley HICON area	98-(913) 784 5793	PIN 992920
Fort Knox AG	98-(942) 942-1092 ext 617	PIN 992920
Fort Rucker AG	98-(334) 598-3006 ext 234	PIN 992920

Command and Control

STOWEX 96 Exercise Director - LTC Jim Connelly (Fort Riley) -
STOWEX 96 Technical Director - LTC Mike Kwan (NSC) -
STOWEX 96 Technical Advisor - Tom Lasch (STRICOM) -
Fort Riley POC - George Eads - (913) 239-1492
Fort Knox POC - LTC Skip Wentz - (502) 624-7558
Fort Rucker POC - MAJ Al Huber (334) 225-9731

National Simulation Center, Fort Leavenworth, KS

Technical Control (913) 684-8370 (conference call); 684-8364
Exercise Control (913) 684-8312 (conferences call); 684-8369
Visitor Center (913) 684-8366
BBS Support Team, CUBIC (913) 684-8455

POCs
SFC Hunter (913) 684-8311
FAX (913) 684-8427

Mounted Warfare Test Bed, Fort Knox, KY

Technical Control (AG) - (502) 942-1092 ext 617
Exercise Control (LRS) - (502) 942-5633

<u>POCs</u>
Mike Krages (502) 942-1092
Eb Kieslich (502) 942-1092

TELEPHONE DIRECTORY - Cont.

SIMNET Training Center, Fort Knox, KY

Exercise Control (ModSAF) - (502) 624-3667

POCs
Jeff Skilling (502) 624-8066

Battle Simulation Center (BSC), Fort Riley, KS

Technical Control (HICON area) - (913) 784-5793
Technical Control (AG) - (913) 239- 1290
Exercise Control - (913) 784-5796

POCs
George Eads - (913) 239-1492
FAX (913) 239-1491

Aviation Test Bed, Fort Rucker, Al.

Technical Control (334) 598- 3066 ext 234
Exercise Control (334) 598- 3066 ext 251

POCs
John Lowry, Operations (334) 598-3066
Glen Hicks, Technical (334) 598-3066
FAX (334) 598-5370

Army Simulation Center (ASC), Pentagon

POCs
John Ferguson (703) 695-1267

DSI Customer Service Center

DSI NCC (913) 758-1358
Help Desk 1-(800) 259 9660
FAX (703) 243-8290

Other Administrative Numbers

Network Control Site (NCS) for Tactical Communications
MSG Sonnier DSN 856-1512, Comm (913)239-1512

BSC Work Cells Telephone Numbers
(913) 239-xxxx

Function	Phone
HICON	1293
EXCON	1512
OPFOR	1294
AAR Prep	1408
AAR Room	1496
Division Response Cell	1509/1510
BDE CDR	1296
2-34 AR	1299
1-16 IN	1401
101 FSB BSA	1402
1-5 FA	1403
BDE Control	1404 / 1405
Task Force CSS	1292
Analyst Area	1295 / 1407 / 1503
OC Area	1409, 1410
BCTP OPS	1501, 1504 Fax - 1497
STOWEX	1505, 1506
NCS	1513

BSC Work Cells Telephone Numbers
(913) 784-xxxx

Function	Phone
STRIPES	5808

Tactical Communications RT31 Interface
Telephone Numbers

Site	Network	Phone Number
Fort Riley	Command Net	Comm (913) 784-6067
	O&I Net	Comm (913) 784-6076
	A&L Net	Comm (913) 784-6014
	FS Net	Comm (913) 784-6093
	Spare	Comm (913) 784-6074
Fort Knox	-	-
	Command Net	DSN 464-8782 Comm (502) 624-8782
	O&I Net	DSN 464-8778 Comm (502) 624-8778
	A&L Net	DSN 464-8785 Comm (502) 624-8785
	FS Net	DSN 464-8786 Comm (502) 624-8786
	IFSAS	DSN 464-8782 Comm (502) 624-8782
Fort Rucker	-	-
	Command Net	(334) 598-1382
	O&I Net	(334) 598-1380
	A&L Net	(334) 598-1383

RT31 User Instructions

The NCS (Network Control Site) located at the BSC in Fort Riley will initiate the conference telephone calls linking Fort Knox and Fort Rucker with the tactical communication network. The NCS will initiate the Command net, the O&I net, the A&L net and the FS net.

RT31 users at all sites will perform the following steps in establishing each of the tactical networks:

1. Locate RT31's in work cell sufficiently separated that audio feedback will not occur (typically 3-4 feet).
2. Adjust the RT-31volume control to midrange.
3. Verify that transmit (TX) and intercom (unmarked) lights are off. If the intercom light is illuminated, toggle the front panel switch.
4. When the NCS initiated call is received, pick-up the commercial phone handset.
5. Upon establishing the voice connection on the commercial phone, disconnect the handset.
6. Adjust RT31 volume control as required.

RT31 users will perform the following steps during communication:

1. Tactical communication network reception is played through the RT31 speaker.
2. To transmit on the network, pick up RT31 handset and key the push-to-talk (PTT) button. Note - During transmission , the transmit light (TX) is illuminated.

Communication Bubble Diagrams

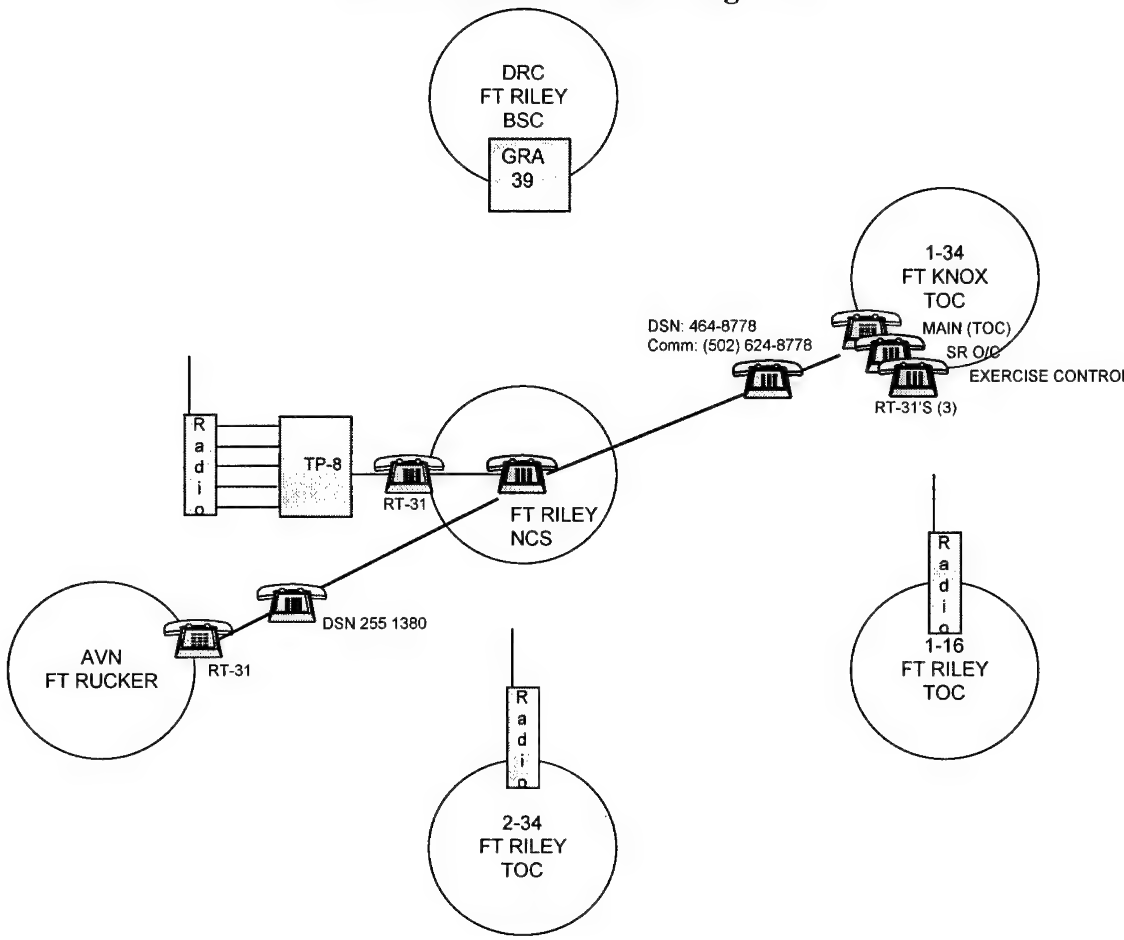


Figure D-1 Operational and Intelligence Network

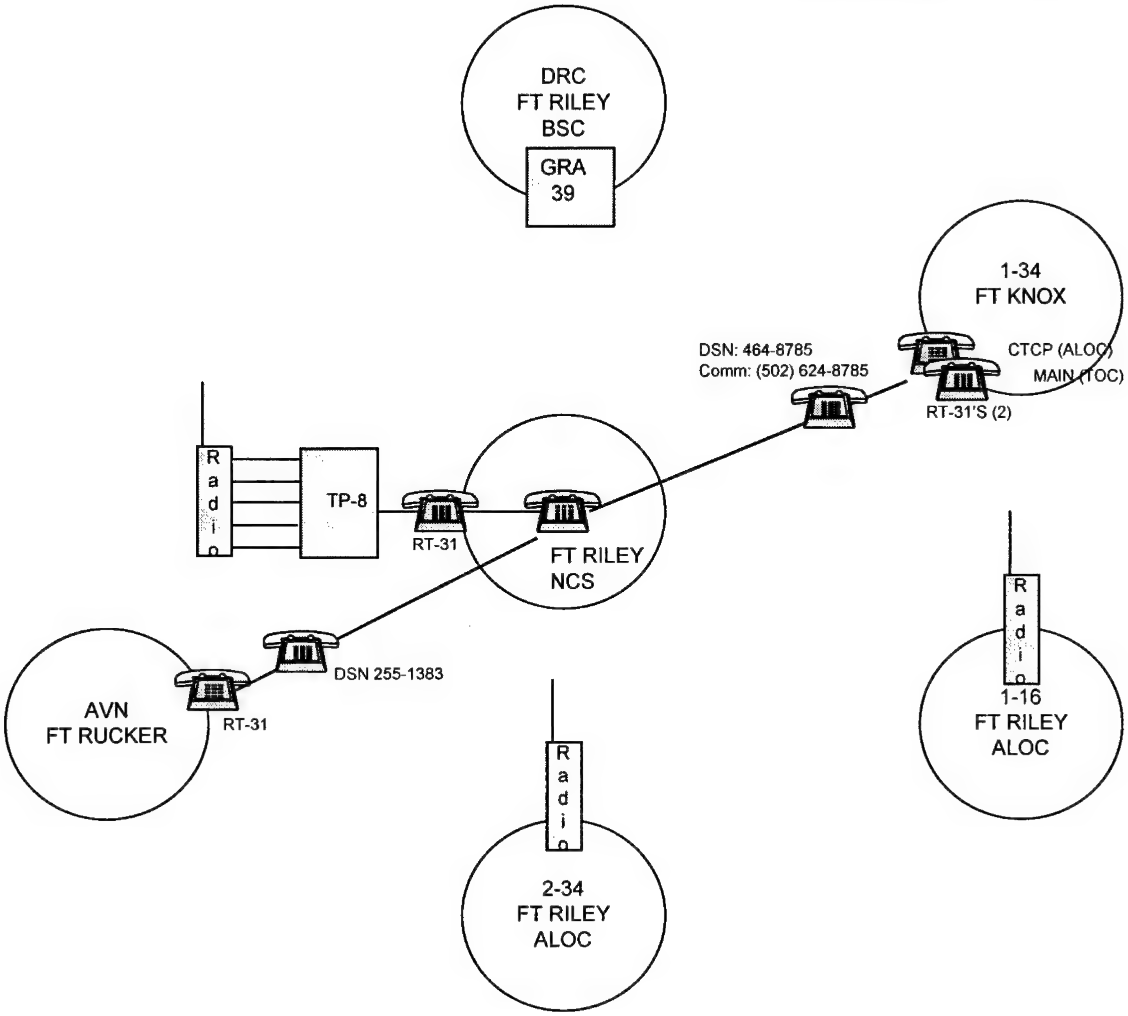


Figure D-2 Administrative and Logistics Network

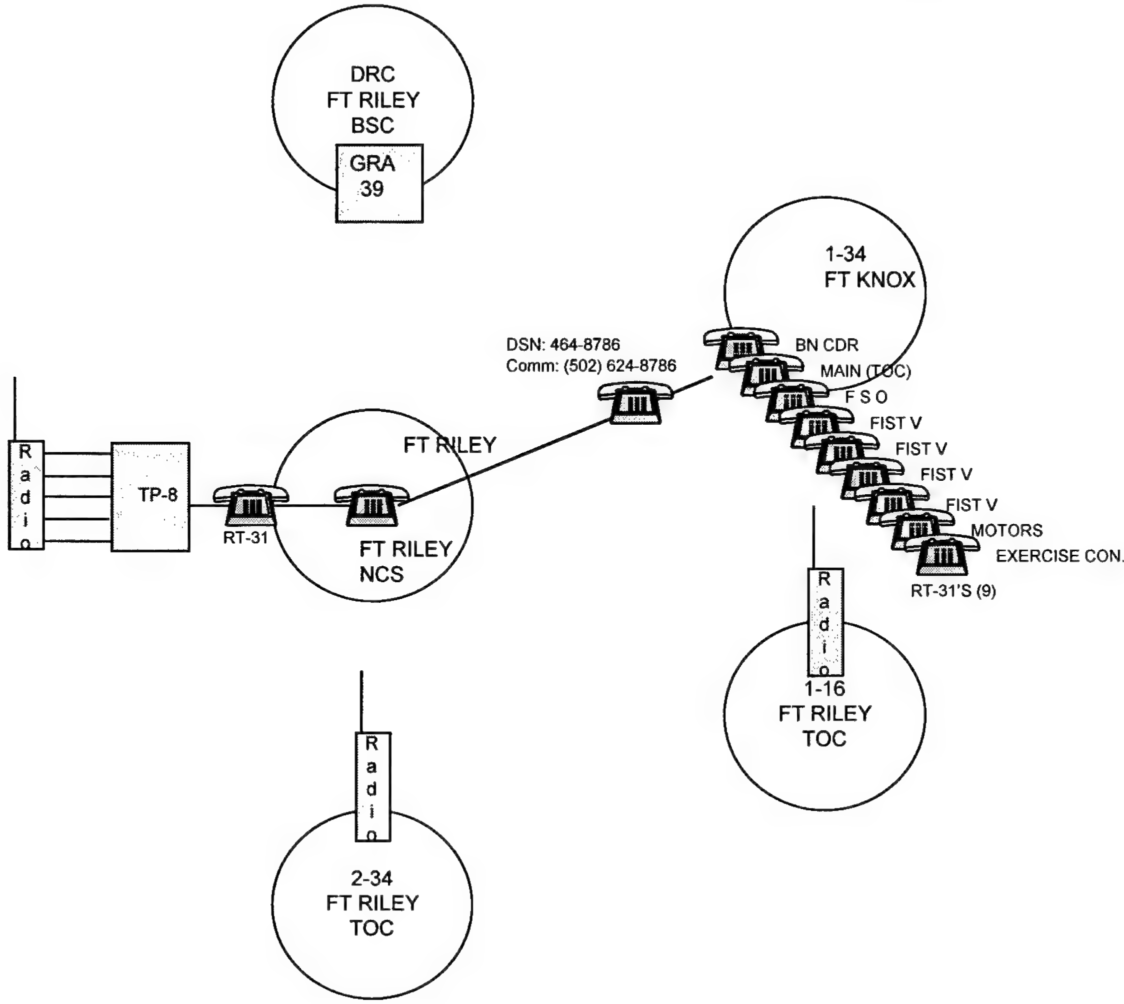
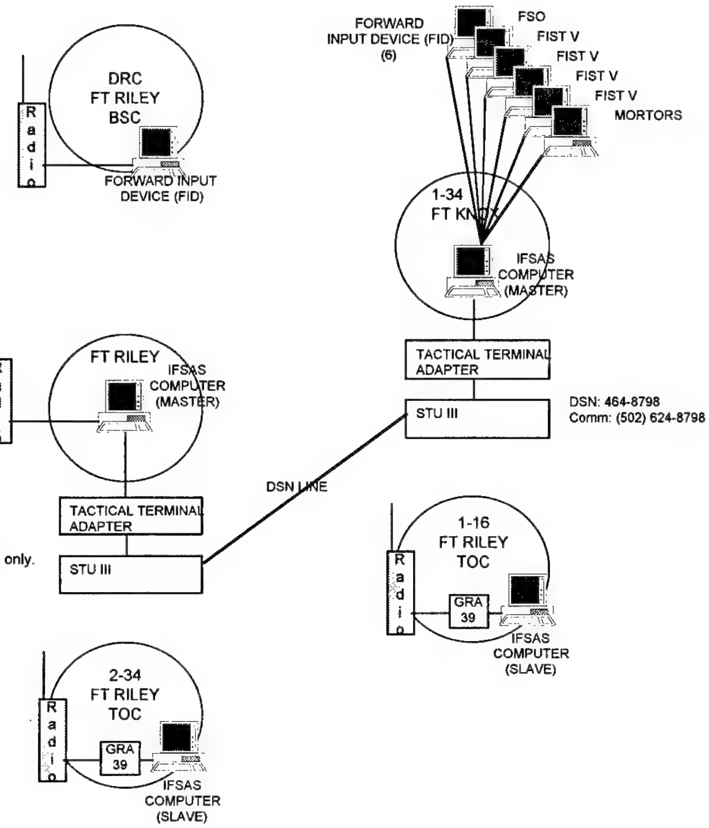


Figure D-3 Fire Support Net



Note: This block diagram is provided for informational purposes only.
The FS Digital Network was not implemented for STOWEX 96.

Figure D-4 Fire Support Digital Net

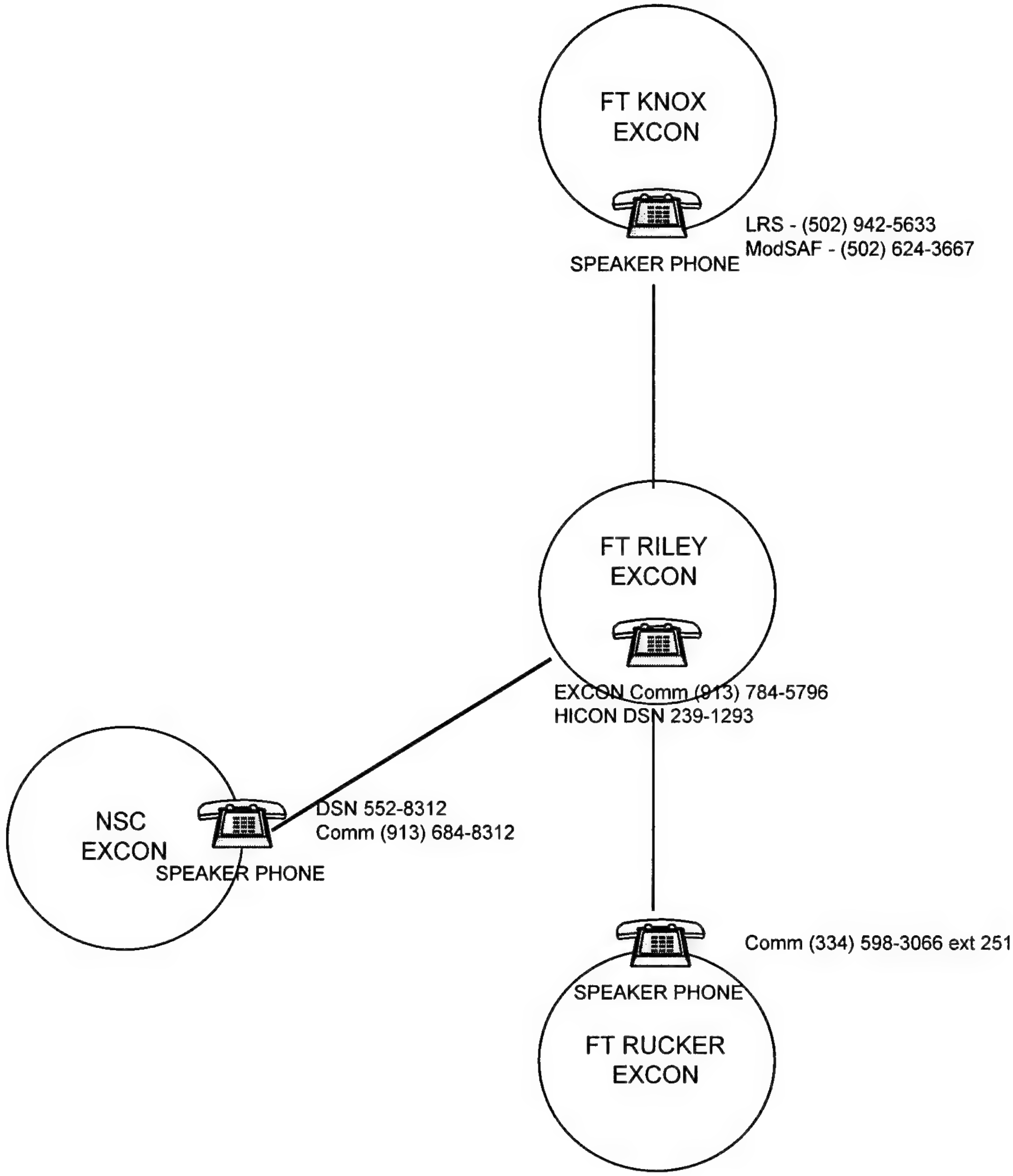


Figure D-5 Exercise Control Voice Communications

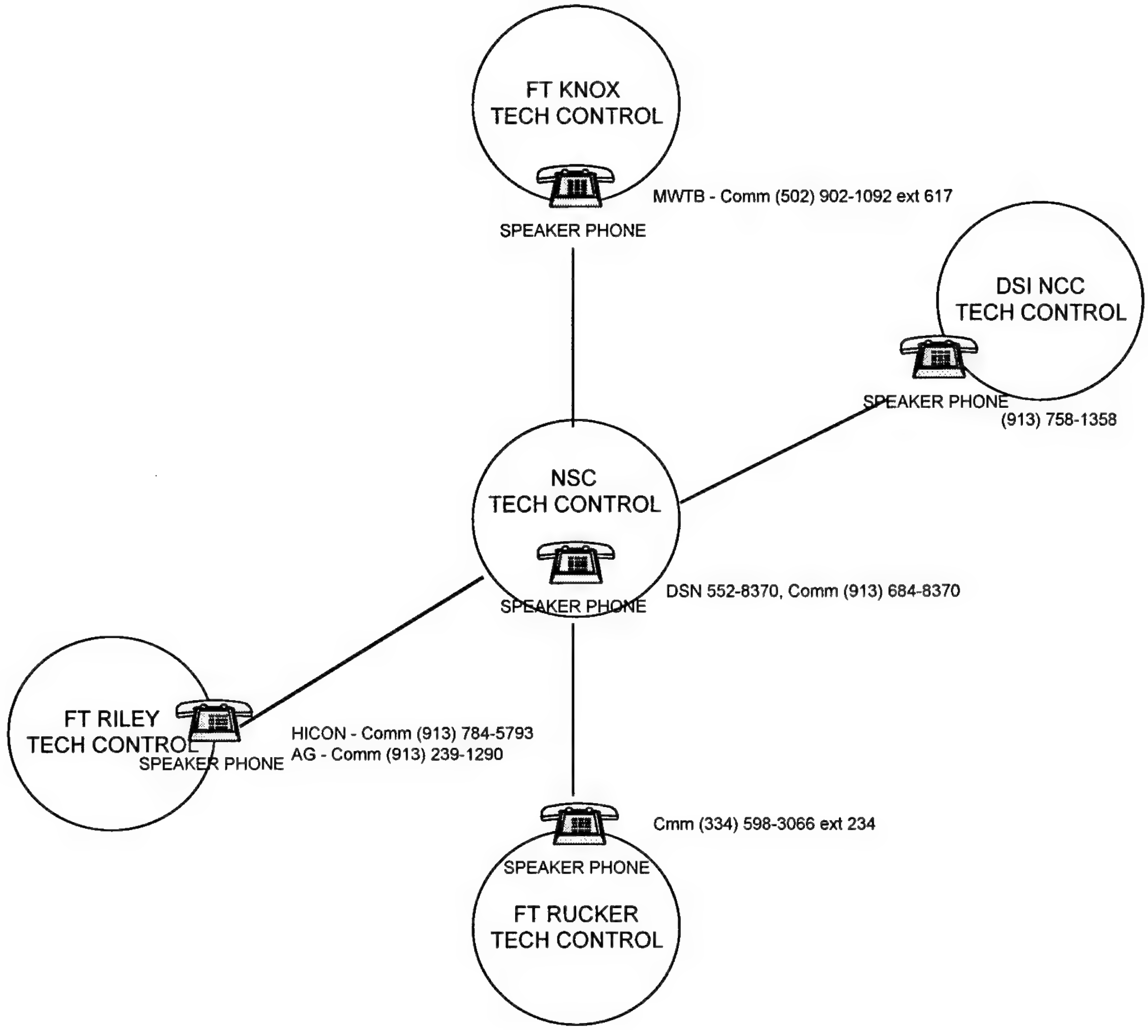


Figure D-6 Technical Control Voice Communications

Signal Operating Instructions and Radio Telephone Operating Procedures

Pro-Words:

OVER: used to momentarily pass control of the net to the sender / receiver and to notify the distant party your transmission is complete

OUT: closes the transmission. The party originating the transmission closes the transmission with "OUT". The pro-word "OUT" is never used in conjunction with "OVER".

MORE-TO-FOLLOW: used by the sender to indicate either a pause in a message or that more information will immediately follow.

BREAK: used to indicate a separation between the header, body text and footer in a transmitted message.

SAY AGAIN: used by the receiver to request clarification if a message is not received clearly. Format: "Say again after..., Say again before....".

I SPELL: used to insure message clarity when difficult words or place names are contained in a text message. Format: I SPELL Cho Won, Charlie, Hotel, Oscar, Whiskey, Oscar, November.

WILCO (Will Comply): acknowledges receipt of a message with a tasking or order.

ROGER: informs the sender that a message is affirmed.

WAIT ONE: indicates to sender to stop transmission momentarily, and then proceed.

WAIT OUT: indicates to sender that receiver cannot receive the message at this time and ends the transmission.

Video Teleconferencing

Video teleconference (VTC) is performed at each of the STOWEX 96 sites utilizing a PICTURETEL VTC suite interfacing the Defense Simulation Internet (DSI). STOWEX 96 is using the "Dual Homing" feature of the DSI to provide VTC capability as well as to provide an alternate path for data streams (should the primary path become inaccessible). If the primary data path (exercise data stream) goes down when a VTC session is taking place, priority is given to the training exercise and exercise data streams are transfer to the alternative data path. The "Dual Homing" feature is installed at the NSC (Fort Leavenworth), the BSC (Fort Riley), and the SIMNET Training Center (Fort Knox). The Army Simulation Center (ASC) and the Aviation Test Bed (Fort Rucker) can access either the exercise data streams or the VTC session but not both concurrently.

Exercise Control at the BSC (Fort Riley) will serve as the Net Control Station (NCS) or "moderator" for multi-point conferences to each site. A "moderated" conference controls who has the floor or view, rather than each site controlling its own view. VTC events and a time window in which the conference is expected to be conducted are listed below:

Date	Event Window	Event
3 Sept.	1000 - 1200	Rehearsal
3 Sept.	1400 - 1900	OC meeting
4 Sept.	1300 - 1600	BDE FRAGO
4 Sept.	1600 - 1900	AAR 1
5 Sept.	1300 - 1600	TF 1-34 Brief Back
6 Sept.	1500 - 1900	AAR 2

VTC Moderator Check-list
(extracted from the DSI Operating Procedures Course *)

1. Prior to the scheduled VTC, ping each of the participant's SUN workstation.
2. Ensure that all sites participating in the VTC have logged in to their SUN workstations and Vteam is up and running.
3. Initiate the ***talk*** command between the sites. (You will have to open a new window for each site).
4. Configure the codec for point to point or multipoint
5. At the scheduled conference time, start Vteam.

* Reference chapter 5 of the DSI Operating Procedures Course for detailed instructions for system installation and configuration.

TCP/IP Addressing

Table D-1 DIS TCP/IP Application Gateway Addresses

AG	IP Address
National Simulation Center (NSC)	164.217.15.2
Fort Riley	164.217.213.2
Fort Knox	164.217.2.2
Fort Rucker	164.217.4.2
Army Simulation Center (ASC)	164.217.197.2

Table D-2 NSC IP Addresses

Equipment	IP Address
AG -NSC (DIS)	164.217.15.2
AG to XCIAU1	192.9.199.3
XCIAU1 to AG	192.9.199.2
XCIAU1 to Main DIS Network	192.9.201.2
Tech Control PVD to Main DIS Network	192.9.201.15
Tech Control Logger to Main DIS Network	192.9.201.16
Tech Control Stealth to Main DIS Network	192.9.201.17
Tech Control Sound to Main DIS Network	192.9.201.18
XCIAU2 to Main DIS Network	192.9.201.3
XCIAU2 to BBS	192.9.200.3
OPSIN to BBS	164.217.20.10
OPSIN to ModSAF	192.9.200.10
BBS - ModSAF1	192.9.200.11
BBS - ModSAF2	192.9.200.12
BBS - ModSAF3	192.9.200.13
BBS - ModSAF4	192.9.200.14
BBS - ModSAF5	192.9.200.15
BBS - ModSAF6	192.9.200.16
BBS - ModSAF7	192.9.200.17
BBS - ModSAF8	192.9.200.18
BBS - ModSAF9	192.9.200.19
BBS - ModSAF10	192.9.200.20
ModSAF Frontend	192.9.200.21
XCIAU3 to Main DIS Network	192.9.201.5
XCIAU to Visitor Center DIS	192.9.222.15
STRIPES PVD to Visitor Center DIS	192.9.222.10
STRIPES 3D to Visitor Center DIS	192.9.222.11
Sound Storm to Visitor Center DIS	192.9.222.12

Table D-3 DIS TCP/IP Application Gateway Addresses

AG	IP Address
National Simulation Center (NSC)	164.217.15.2
Fort Riley	164.217.213.2
Fort Knox	164.217.2.2
Fort Rucker	164.217.4.2
Army Simulation Center (ASC)	164.217.197.2

Table D-4 Fort Rucker IP Addresses

Equipment	IP Address
AG - XCIAU1	192.9.202.2
XCIAU1 - AG	192.9.202.3
XCIAU - DIS	192.9.203.3
LAA	192.9.202.4
Logger	192.9.202.5

Table D-5 Fort Knox IP Addresses

Equipment	IP Address
AG - XCIAU1	192.9.208.2
XCIAU1 - AG	192.9.208.3
XCIAU - DIS	192.9.209.3
LAA	192.9.208.4
Logger	192.9.208.5

Table D-6 Fort Riley IP Addresses

Equipment	IP Address
AG - XCIAU1	192.9.240.2
XCIAU1 - AG	192.9.240.3
XCIAU - DIS	192.9.241.3
Logger	192.9.240.4
PVD	192.9.241.10
Stealth	192.9.241.11
Sound Storm	192.9.241.12

Table D-7 ASC IP Addresses

Equipment	IP Address
AG - XCIAU1	
XCIAU1 - AG	
XCIAU - DIS	
Logger	
PVD	
Stealth	
Sound Storm	

Tactical Communications

Radio / Telephone Interface

a. Cable - Interface between the TP-8 Tone Panel and the RT -1029 mount a modified CX 4723. This cable will be modified into a "Pigtail" with the following pinout at the connector (remaining wires not used):

Connector Pin	Wire Color	Definition on RT1029
A	Black	Ground
S	White on Red	Push to Talk
U	Red on White	MIC
K	White on Blue	RX In

b. Cable to TP-8 Interface.

(1) Connect CX4723 to the terminal strip

J22 Connector on RT1029 mount

TP-8

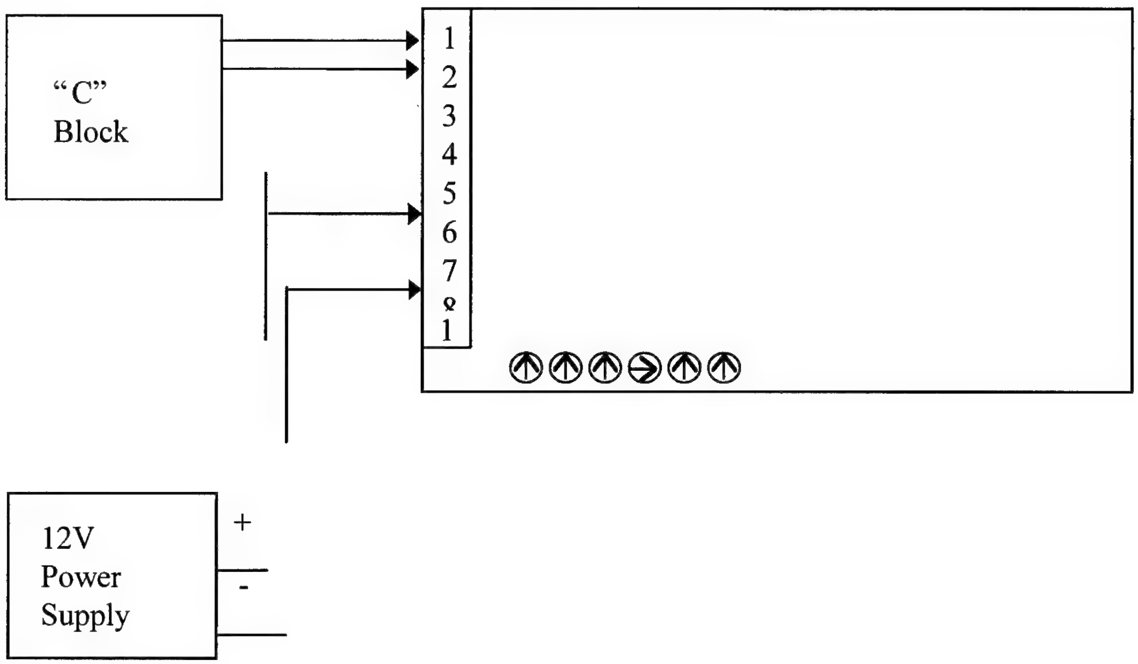
Definitions: 4 = Ground

5 = Push to Talk (Tone burst received from RT-31 keys RT-524)

6 = Mic (Audio TX to/from RT-524)

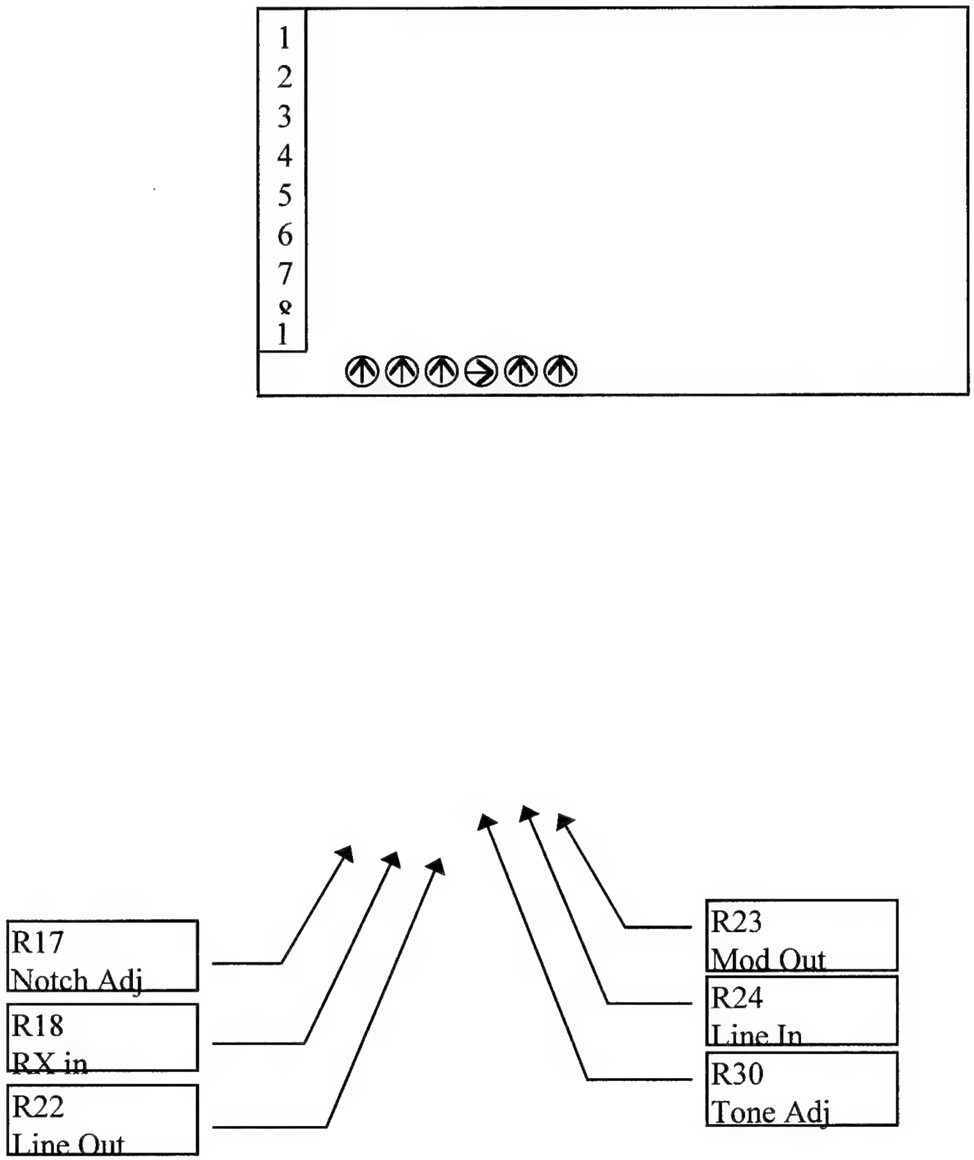
7 = RX in (Audio RX to/from RT 524)

(2) Connect DCO and power lines.



NOTE: It is recommended that a "C" block be mounted to the TP-8 to provide easy installation to DCO.

(3) Adjust "Pot's" on TP-8 as shown:



Notes: R17, R18 and R24 are used to adjust levels coming from the RT-31

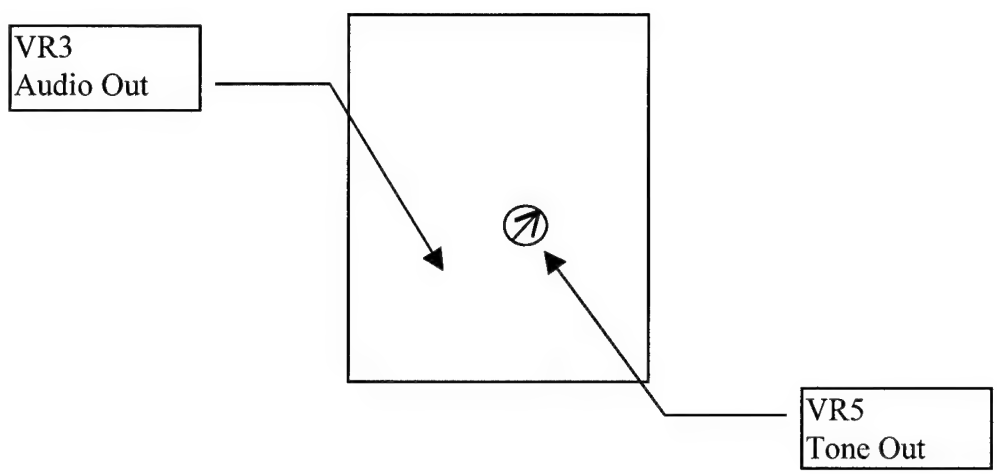
R22 and R23 are used to adjust levels coming from the RT-524

R30 adjusts the tone burst from the RT-31 which keys the radio

c. RT-31 Intercom Telephone.

(1) Disconnect spring on hook switch inside the intercom to allow receive audio while hand set is off hook.

(2) Adjust "Pot's" as shown:



Front of RT-31

Appendix E

Shipping Data

Table E-1 STOWEX 96 Shipping List, Fort Leavenworth

NSC	Indigo2 Maximum Impact w/keyboard and monitor	LM00685	STRIPES 3D	R10000, 64MB, 2GB, Additional 192MB installed, IRIX 6.2, 4MB texture memory installed, ICO not received
NSC	Spaceball	LM00787		
NSC	Mitsubishi monitor	LM00672		
NSC	Mitsubishi monitor	LM00949		
NSC	Mitsubishi monitor	LM00956		
NSC	Indigo2 Solid Impact w/keyboard and monitor	LM00703	Farm PVD	R10000, 64MB, 2GB, Additional 64MB installed, Additional 128MB installed; IRIX 6.2
NSC	Indigo2 Solid Impact w/keyboard and 20" monitor	LM00700	Farm	R10000, 64MB, 2GB, Additional 64MB installed, IRIX 6.2
NSC	Indigo2 Solid Impact w/keyboard and 20" monitor	LM00724	Farm	R10000, 64MB, 2GB, Additional 64MB installed, IRIX 6.2
NSC	Indigo2 Solid Impact w/keyboard and 20" monitor	LM00681	spare	R10000, 64MB, 2GB, Additional 64MB installed, IRIX 6.2
NSC	Indigo2 Solid Impact w/keyboard and 20" monitor	LM00721	Farm spare	R10000, 64MB, 2GB, Additional 64MB installed, IRIX 6.2
NSC	Deskside Onyx w/keyboard and 21" monitor		STRIPES 3D	64MB, 2GB RE2, Additional 64MB installed, 16MB texture memory, IRIX 6.2, MCO BOB
NSC	Spaceball (hold until AcuSoft is finished)			
NSC	Mitsubishi monitor	LM00667		
NSC	Mitsubishi monitor	LM00670		
NSC	Mitsubishi monitor	LM00671		
NSC	Indigo2 w/keyboard and 20" monitor	SGI loaner		
NSC	Indigo2 w/keyboard and 20" monitor	SGI loaner		
NSC	(7) 50' RGB cables	n/a		
NSC	(1) 13W3 Amplifier	LM00964		
NSC	(2) 13W3 Adapters	n/a		
NSC	(1) transceiver	n/a		
NSC	(14) Surge protectors	n/a		
NSC	24 port hub	need		
NSC	spool 10BaseT cable	n/a		
NSC	crimp tool	n/a		
NSC	(1) Intel card	n/a		
NSC	connectors	n/a		
NSC	4mm tape drive	LM01009		
NSC	128MB kit			
NSC	4mm tapes			

Table E-2 STOWEX 96 Shipping List, Fort Riley

Riley	Indigo2 Maximum Impact w/keyboard and monitor	LM00686	STRIPES 3D	R10000, 64MB, 2GB, Additional 192MB installed, 4MB texture memory installed, ICO not received; IRIX 6.2
Riley	Spaceball	LM00785		
Riley	Mitsubishi monitor	LM00668		
Riley	Mitsubishi monitor	LM00669		
Riley	Mitsubishi monitor	LM00954		
Riley	Indigo2 20" monitor	LM00707		
Riley	Indigo2 w/keyboard and 20" monitor	LM00905	STRIPES PVD	R4400, 64MB, 2GB, Additional 64MB installed, Oracle installed; IRIX 5.3
Riley	CD ROM Drive	LM00947		
Riley	9GB Drive	LM01012		
Riley	4mm Tape Drive	LM01011		
Riley	Indigo2 w/keyboard and 20" monitor	LM00903	Logger	R4400, 64MB, Additional 64MB installed, IRIX 5.3
Riley	Indigo2 w/keyboard and 20" monitor	LM00902	XCIAU-1	R4400, 128MB, 2GB, IRIX 5.3, Dual Ethernet card installed
Riley	Indigo2 w/keyboard and 20" monitor	LM01005	AG	R4400, 64MB, 2GB, IRIX 5.3, Dual Ethernet card installed
Riley	spool 10BaseT cable	n/a		
Riley	crimp tool	n/a		
Riley	(15) speaker phones			
Riley	(15) telephones			
Riley	(15) headsets			
Riley	connectors			
Riley	2 Transceivers	n/a		
Riley	(4) 75' RGB cables	n/a		
Riley	13W3 Amplifier	LM00963		
Riley	(2) 13W3 Adapters	n/a		
Riley	(8) Surge protectors	n/a		
Riley	spool 10BaseT cable	n/a		
Riley	crimp tool	n/a		
Riley	VDA	LM01106		
Riley	8 port hub			
Riley	8 port hub			
Riley	4mm tapes			
Riley	(7) TP-8s5 RT-31s			(drop ship to site)
Riley	(5) RT-31s			(drop ship to site)

Table E-3 STOWEX 96 Shipping List, Other Sites

Site	Equipment	Tag	Function
Fort Knox	(10) Speaker phones (10) Telephones (10) Headsets (20) RT-31s	n/a	Communications Support (drop ship to site)
Fort Rucker	(5) Speaker phones (5) Telephones (5) Headsets (15) RT-31s	n/a	Communications Support (drop ship to site)
Pentagon	1 Ethernet card 1 CD ROM (Ethernet driver) 3 50" RGB cables 2 15' 10BaseT cables 1 64 MB kit	n/a	Network Support

Table E-4 STOWEX 96 Site Addresses and Points of Contact

Site	Address	Points of Contact
Fort Leavenworth	National Simulation Center Building 45 410 Kearney Avenue Fort Leavenworth, KS 66027	LTC Michael Kwan Captain (P) Jerry Bastian SFC Thom Hunter
Fort Riley	Commander, Fort Riley Kansas Building 8388 Fort Riley, KS 66442	George Eads (Government) Steve Bachelor (Cubic)
Fort Knox	Mounted Warfare Test Bed Building 2021 Black Horse Regiment Avenue Fort Knox, KY 40121	Dennis Goard (Logistics), Don Appler (site manager), Mike Krages, Eb Kieslich
Fort Rucker	Aviation Test Bed Corner Nighthawk & 3rd Avenue Building 5101 Fort Rucker, AL 36362	John Railsback (Receiving), John Lowry, Operations; Glen Hicks, Technical
Pentagon	DAMO-ZAS Deputy Chief of Staff Operations & Plan 400 Army Pentagon Washington DC 20310-0400 Lockheed Martin	John Ferguson (COLSA), Jerry Stueve, Lockheed Martin

	1725 Jefferson Davis Hwy. Suite 900 Arlington VA 22202-4159	

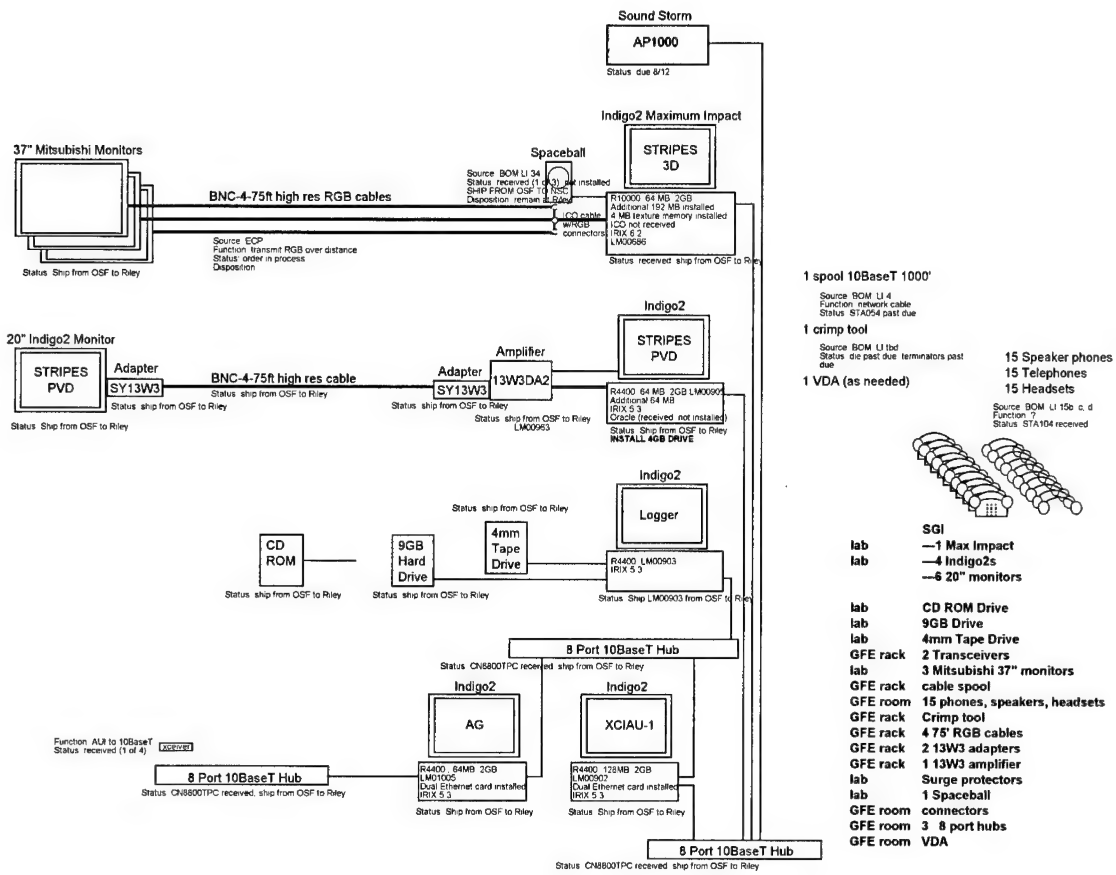


Figure E-1 Fort Riley Equipment Shipment

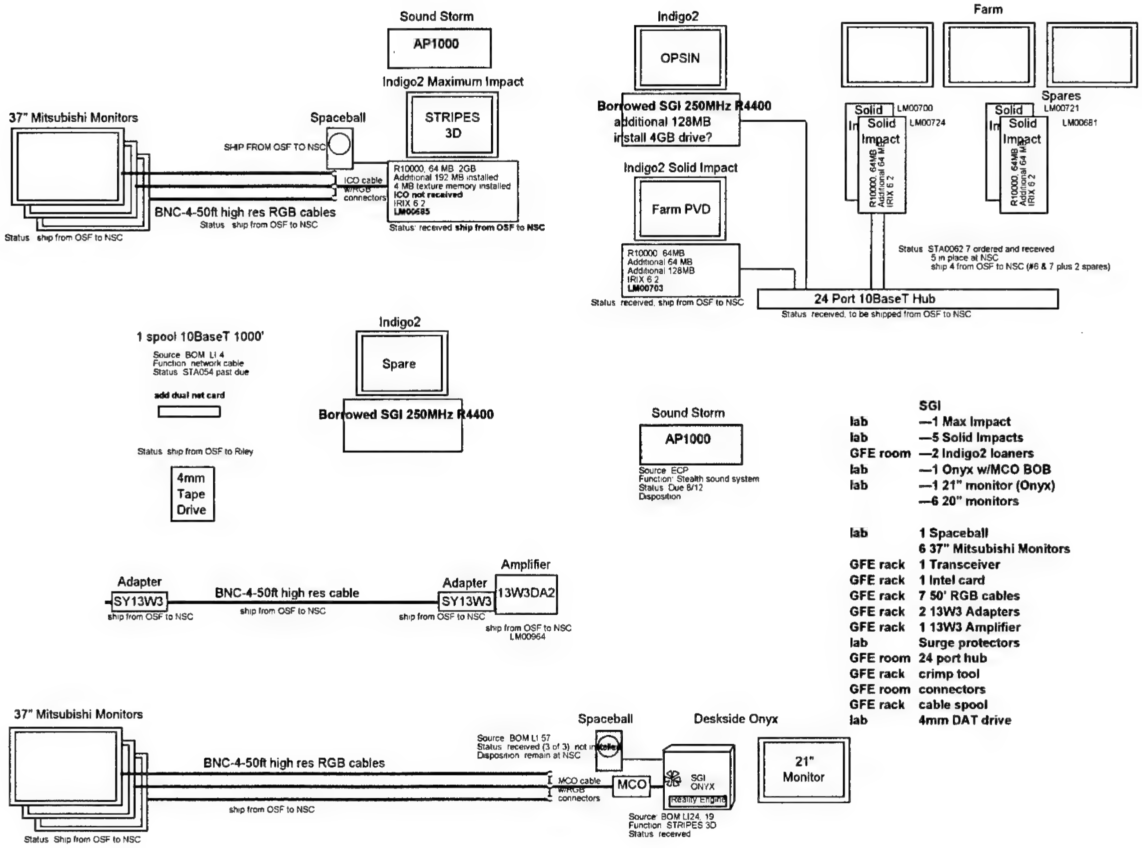


Figure E-2 Fort Leavenworth Equipment Shipment

Appendix F

STOWEX 96 Test Procedures

Appendix G STOWEX 96 Test Log

Appendix H

Technical Control Plan

Appendix I

STOWEX 96 Equipment Disposition

ITEM	PRESENT LOCATION	PROCESSOR TYPE	BUMPER NUMBER	FUNCTION	SOURCE	FINAL LOCATION
MAX IMPACT	ASC	R10K	LM00686	STRIPES 3D	STOWEX	ASC
12 PORT 10-BASE-T	AVTB		A24065	NETWORK	PW95-AVTB	AVTB
12 PORT 10-BASE-T	AVTB		A24066	NETWORK	PW95-AVTB	AVTB
4MM DAT	AVTB		A23641	LOGGER PERIPHERAL	PW95-AVTB	AVTB
5 x SPEAKER PHONES	AVTB		NONE	COMMS	STOWEX	AVTB
8 PORT 10-BASE-T	AVTB		A24080	NETWORK	PW95-AVTB	AVTB
9 GB HD DRIVE	AVTB		A23650	LOGGER PERIPHERAL	PW95-AVTB	AVTB
CD ROM DRV	AVTB		A23658	PERIPHERAL	PW95-AVTB	AVTB
INDIGO 2	AVTB	R4400	A23680	AG	PW95-AVTB	AVTB
INDIGO 2	AVTB	R4400	A24001	OTHER	PW95-AVTB	AVTB
INDIGO 2	AVTB	R4400	A24013	LAA	PW95-AVTB	AVTB
INDIGO 2	AVTB	R4400	A24019	CIAU	PW95-AVTB	AVTB
INDIGO 2	AVTB	R4400	A24022	LOGGER	PW95-AVTB	AVTB
QIC 1/4' TAPE DRV	NSC		A23638	PERIPHERAL	PW95-AVTB	AVTB
INDIGO 2	NSC	R4400	A23659	BLUE MODSAF	PW95-LWTB	LWTB
INDIGO 2	NSC	R4400	A23683	BLUE MODSAF	PW95-LWTB	LWTB
INDIGO 2	NSC	R4400	A23692	BLUE MODSAF	PW95-LWTB	LWTB
10 x SPEAKER PHONES	MWTB			COMMS	STOWEX	MWTB
12 PORT 10-BASE-T	MWTB		A23633	NETWORK	PW95	MWTB
4MM DAT	MWTB		A23643	LOGGER PERIPHERAL	STOWEX	MWTB
8 PORT 10-BASE-T	MWTB		A24082	NETWORK	PW95	MWTB
9 GB HD DRIVE	MWTB		A23653	LOGGER PERIPHERAL	PW95	MWTB
CD ROM DRV	MWTB		A23655	PERIPHERAL	PW95	MWTB

INDIGO 2	MWTB	R4400	A23577	LOGGER	PW95-MWTB	MWTB
INDIGO 2	MWTB	R4400	A23604	AG	PW95-MWTB	MWTB
INDIGO 2	MWTB	R4400	A23613	CIAU	PW95-MWTB	MWTB
INDIGO 2	MWTB	R4400	A23616	LAA	PW95-MWTB	MWTB
QIC 1/4' TAPE DRV	MWTB		A23637	PERIPHERAL	PW95	MWTB
12 PORT 10-BASE-T	NSC		A23575	NETWORK	PW95	NSC
3012T-12 PORT	NSC		A24076	CENTRECOM HUB	PW95	NSC
3012T-12 PORT	NSC		A24074	CENTRECOM HUB	PW95	NSC
3012T-12 PORT	NSC		A24068	CENTRECOM HUB	PW95	NSC
3024TR-24 PORT	NSC		LM00960	CENTRECOM HUB	STOWEX	NSC
13W3DA2 AMP/SPLITTER	NSC		LM00964	AMPLIFY VIDEO SIGNAL	STOWEX	NSC
20" SGI RGB MONITOR	NSC		A23570	BLUE MODSAF	PW95	NSC
20" SGI RGB MONITOR	NSC		A23579	SAFSIM FARM	PW95	NSC
20" SGI RGB MONITOR	NSC		A23585	SAFSIM FARM	PW95	NSC
20" SGI RGB MONITOR	NSC		A23588	CIAU-2	PW95	NSC
20" SGI RGB MONITOR	NSC		A23597	LOGGERTECH	PW95	NSC
20" SGI RGB MONITOR	NSC		A23600	OPSIN	PW95	NSC
20" SGI RGB MONITOR	NSC		A23627	CIAU-3	PW95	NSC
20" SGI RGB MONITOR	NSC		A23664	BLUE MODSAF	PW95	NSC
20" SGI RGB MONITOR	NSC		A23667	SAFSIM FARM	PW95	NSC
20" SGI RGB MONITOR	NSC		A23670	SAFSIM FARM	PW95	NSC
20" SGI RGB MONITOR	NSC		A23679	SAFSIM FARM	PW95	NSC
20" SGI RGB MONITOR	NSC		A23688	SAFSIM FARM	PW95	NSC
20" SGI RGB MONITOR	NSC		A24006	CIAU-1	PW95	NSC
20" SGI RGB MONITOR	NSC		A24009	BLUE MODSAF	PW95	NSC
20" SGI RGB MONITOR	NSC		A24018	AG	PW95	NSC
20" SGI RGB MONITOR	NSC		A24012	SAFSIM FARM	PW95	NSC
20" SGI RGB MONITOR	NSC		LM00602	DEMO STEALTH	STOWEX	NSC
20" SGI RGB MONITOR	NSC		LM00698	VISIT PVD	PW95	NSC
20" SGI RGB MONITOR	NSC		LM00704	SAFSIM FARM	STOWEX	NSC
20" SGI RGB MONITOR	NSC		LM00713	BLUE MODSAF	STOWEX	NSC
20" SGI RGB MONITOR	NSC		LM00716	FARM FRONT PVD	STOWEX	NSC
20" SGI RGB MONITOR	NSC		LM00725	TECHPVD	STOWEX	NSC
20" SGI RGB MONITOR	NATIONS		A23609	DEVELOPMENT	PW95	NSC
20" SGI RGB MONITOR	NATIONS		A23661	DEVELOPMENT	PW95	NSC

20" SGI RGB MONITOR	NATIONS		A23621	DEVELOPMENT	PW95	OSF
KEYBOARD	NSC		LM00900	SAFSIM FARM	STOWEX	NSC
21" SGI RGB MONITOR	NSC		LM00627	ONYX STEALTH	STOWEX	NSC
37" MONITOR	NSC		LM00667	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	FRKS		LM00668	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	FRKS		LM00669	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	NSC		LM00670	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	NSC		LM00671	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	NSC		LM00672	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	NSC		LM00949	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	FRKS		LM00954	3D PERIPHERAL	STOWEX	NSC
37" MONITOR	NSC		LM00956	3D PERIPHERAL	STOWEX	NSC
4MM DAT	NSC		LM01009	LOGGER PERIPHERAL	STOWEX	NSC
8 PORT 10-BASE-T	NATIONS		A24077	NETWORK	PW95	NSC
8 PORT 10-BASE-T	NSC		A24078	NETWORK	PW95	NSC
8 PORT 10-BASE-T	NSC		A24084	NETWORK	PW95	NSC
9 GB HD DRIVE	NSC		A23652	LOGGER PERIPHERAL	PW95	NSC
CD ROM DRV	NSC		A23657	PERIPHERAL	PW95	NSC
INDIGO 2	NSC	R4400	A23583	STRIPES PVD	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A23586	STRIPES PVD	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A23589	CIAU-2	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A23592	BLUE MODSAF	PW95-OSF	NSC
INDIGO 2	NATIONS	R4400	A23598	DEVELOPMENT	PW95-OSF	NSC
INDIGO 2	NSC	R4400	A23610	CIAU-3	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A23625	STRIPES LOGGER	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A23662	AG	PW95-OSF	NSC
INDIGO 2	NATIONS	R4400	A23668	DEVELOPMENT	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A23671	BLUE MODSAF	PW95-OSF	NSC
INDIGO 2	NSC	R4400	A23686	BLUE MODSAF	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A24007	BLUE MODSAF	PW95-NSC	NSC
INDIGO 2	NSC	R4400	A24016	CIAU-1	PW95-NSC	NSC
KEYBOARD	NSC		LM00625	ONYX STEALTH	STOWEX	NSC
KEYBOARD	NSC		A23565	BLUE MODSAF	PW95	NSC
KEYBOARD	NSC		A23584	LOGGERTECH	PW95	NSC
KEYBOARD	NSC		A23587	CIAU-3	PW95	NSC
KEYBOARD	NSC		A23614	CIAU-1	PW95	NSC
KEYBOARD	NSC		A23663	CIAU-2	PW95	NSC
KEYBOARD	NSC		A23666	TECHPVD	STOWEX	NSC
KEYBOARD	NSC		A23672	BLUE MODSAF	PW95	NSC
KEYBOARD	NSC		A23687	OPSIN	PW95	NSC
KEYBOARD	NSC		A24005	BLUE MODSAF	PW95	NSC
KEYBOARD	NSC		A24008	AG	PW95	NSC
KEYBOARD	NSC		LM00603	DEMO STEALTH	STOWEX	NSC
KEYBOARD	NSC		LM00687	VISIT PVD	STOWEX	NSC
KEYBOARD	NSC		LM00688	SAFSIM FARM	STOWEX	NSC
KEYBOARD	NSC		LM00696	SAFSIM FARM	STOWEX	NSC
KEYBOARD	NSC		LM00699	FARM FRONT PVD	STOWEX	NSC
KEYBOARD	NSC		LM00705	SAFSIM FARM	STOWEX	NSC
KEYBOARD	NSC		LM00708	SAFSIM FARM	STOWEX	NSC
KEYBOARD	NSC		LM00711	SAFSIM FARM	STOWEX	NSC

KEYBOARD	NSC		LM00714	SAFSIM FARM	STOWEX	NSC
KEYBOARD	NSC		LM00717	SAFSIM FARM	STOWEX	NSC
KEYBOARD	NSC		LM00723	BLUE MODSAF	STOWEX	NSC
KEYBOARD	NATIONS		A23678	DEVELOPMENT	PW95	NSC
KEYBOARD	NATIONS		A24011	DEVELOPMENT	PW95	NSC
KEYBOARD	NATIONS		A23660	DEVELOPMENT	PW95	OSF
9 GB HD DRIVE	NATIONS		A23648	LOGGER PERIPHERAL	PW95	LWTB
MAX IMPACT	NSC	R10K	LM00685	STRIPES 3D	STOWEX	NSC
D4-MCO-BOB	NSC		LM00673	MULTI-CHANNEL OPTION	STOWEX	NSC
ONYX	NSC	4 X R4400	LM00624	3D	STOWEX	NSC
QIC 1/4' TAPE DRV	NSC		A23639	PERIPHERAL	PW95	NSC
SOLID IMPACT	NSC	R10K	LM00681	OPSIN	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00695	SAFSIM FARM	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00700	SAFSIM FARM	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00703	FARM SPARE	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00706	SAFSIM FARM	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00709	SAFSIM FARM	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00712	SAFSIM FARM	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00718	SAFSIM FARM	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00721	SAFSIM FARM	STOWEX	NSC
SOLID IMPACT	NSC	R10K	LM00724	FARM PVD	STOWEX	NSC
SOUND STORM	NSC		AP1000-960815-01	3D PERIPHERAL- VISIT		NSC
SOUND STORM	NSC		AP1000-960815-03	3D PERIPHERAL -TECH		NSC
SPACE BALL	FRKS		LM00785	3D PERIPHERAL	STOWEX	NSC
SPACE BALL	NSC		LM00786	3D PERIPHERAL	STOWEX	NSC
SPACE BALL	NSC		LM00787	3D PERIPHERAL	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013273	UPS-AG	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013278	UPS-CIAU-2	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013363	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013366	UPS-FARM FRONT PVD	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013367	UPS-TECHPVD	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013368	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013369	UPS-BLUE MODSAF	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013370	UPS-BLUE MODSAF	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013371	UPS-BLUE MODSAF	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013372	UPS-CIAU-1	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013373	UPS-BLUE MODSAF	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013374	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013375	UPS-OPSIN	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0013376	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0024594	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0024596	UPS-LOGGER	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0024597	UPS-BLUE MODSAF	STOWEX	NSC

TRIPP LITE SMART PRO	NSC		S/N D0024598	UPS-VISIT PVD	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0024599	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0024600	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0024601	UPS-SAFSIM FARM	STOWEX	NSC
TRIPP LITE SMART PRO	NSC		S/N D0024593	UPS-CIAU-3	STOWEX	NSC
1000' 10 BASE T SPOOL	FRKS			NETWORK	STOWEX	NSC/FRKS
13W3DA2 AMP/SPLITTER	FRKS		LM00963	AMPLIFY VIDEO SIGNAL	STOWEX	NSC/FRKS
15 x SPEAKER PHONES	FRKS		NONE	COMMS	STOWEX	NSC/FRKS
20" SGI RGB MONITOR	FRKS		LM00675	PVD	STOWEX	NSC/FRKS
20" SGI RGB MONITOR	FRKS		LM00677	LOGGER	STOWEX	NSC/FRKS
20" SGI RGB MONITOR	FRKS		LM00684	CIAU	STOWEX	NSC/FRKS
20" SGI RGB MONITOR	FRKS		LM00707	AG	STOWEX	NSC/FRKS
4MM DAT	FRKS		LM01011	LOGGER PERIPHERAL	STOWEX	NSC/FRKS
8 PORT 10-BASE-T	FRKS		LM001111	NETWORK	STOWEX	NSC/FRKS
8 PORT 10-BASE-T	FRKS		LM001112	NETWORK	STOWEX	NSC/FRKS
9 GB HD DRIVE	FRKS		LM01012	LOGGER PERIPHERAL	PW95	NSC/FRKS
CD ROM DRV	FRKS		LM00947	PERIPHERAL	PW95	NSC/FRKS
CRIMP TOOL	FRKS			CABLE CONNECTIONS	STOWEX	NSC/FRKS
INDIGO 2	FRKS	R4400	LM00902	XCAIU-1	PW95-OSF	NSC/FRKS
INDIGO 2	FRKS	R4400	LM00903	LOGGER	PW95-OSF	NSC/FRKS
INDIGO 2	FRKS	R4400	LM00905	STRIPES PVD	PW95-OSF	NSC/FRKS
INDIGO 2	FRKS	R4400	LM01005	AG	PW95-OSF	NSC/FRKS
KEYBOARD	FRKS		LM00689	PVD	STOWEX	NSC/FRKS
KEYBOARD	FRKS		LM00702	CIAU	STOWEX	NSC/FRKS
KEYBOARD	FRKS		LM00897	AG	STOWEX	NSC/FRKS
KEYBOARD	FRKS		LM00898	LOGGER	STOWEX	NSC/FRKS
MAX IMPACT	OSF	R10K	NONE	STRIPES 3D	STOWEX-ASC	NSC/FRKS
SOUND STORM	FRKS			3D PERIPHERAL		NSC/FRKS
4MM DAT	OSF		A23645	LOGGER PERIPHERAL	PW95	OSF
INDIGO 2	NATIONS	R4400	A23677	DEVELOPMENT	PW95-OSF	OSF
INDIGO 2	OSF	R4400	LM00860	DEV LOGGER	PW95	OSF
INDIGO 2	OSF	R4400	LM00904	DEVELOPMENT	PW95	OSF
INDIGO 2	OSF	R4400	LM00995	DEV OPSIN	PW95	OSF
INDIGO 2	OSF	R4400	LM00999	DEV XCAIU-2	PW95	OSF
SOLID IMPACT	OSF	R10K	LM00679	DEV FARM	STOWEX	OSF
SOLID IMPACT	OSF	R10K	LM00693	DEV FARM PVD	STOWEX	OSF
SOLID IMPACT	OSF	R10K	LM01127	DEVELOPMENT	STOWEX	OSF
SOLID IMPACT	OSF	R10K	LM01037	DEVELOPMENT	STOWEX	OSF
SOLID IMPACT	OSF	R10K	LM01039	DEVELOPMENT	STOWEX	OSF
SOLID IMPACT	OSF	R10K	LM01041	DEVELOPMENT	STOWEX	OSF
SOLID IMPACT	OSF	R10K	LM01120	DEV SPARE	STOWEX	OSF
SOLID IMPACT	OSF	R10K	LM01121	DEV SPARE	STOWEX	OSF
INDIGO 2	CAMBR	R4400	A23674	DEVELOPMENT	PW95-OSF	OSF
NOTES:						

1-MOVE TO FINAL LOCATION AFTER NO LONGER NEEDED FOR DEVELOPMENT
2- CURRENTLY INOP. WILL BE FIXED AND REMAIN AT OSF; NSC GAINS ONE MORE IN THE ONYX
3-PURCHASED FOR FRKS; SENT TO ASC TO COVER LATE SHIPMENT. TO REMAIN AT ASC; FRKS TO RECEIVE NEW (ASC) MAX IMPACT
4-ORIGINAL PLAN WAS TO LEAVE AT NSC. NOW, SEND TO OSF FOR THRU SHIPPING TO LWTB. NSC TO RECIEVE 128K R4400 FORNATIONS IN PLACE OF THIS ONE
5-ICO BOARD NOT YET RECEIVED; WHEN RECIEVED, LMC TO INSTALL/TEST ON SITE.

Appendix J

Exercise Control Plan Outline

1.0 INTRODUCTION

2.0 BACKGROUND

3.0 DEMONSTRATION PROFILE
3.1 Purpose
3.1.4 Capabilities to be Demonstrated
3.2 Scope
3.2.1 Equipment to be Linked
3.2.3 Experiment Layout

4.0 REQUIREMENTS
4.1 Scenario:
4.1.1 ModSAF Activities: ModSAF scenarios to be built; locations for running ModSAF; ModSAF Capabilities Required: i.e., special capabilities such as towing, specific CS/CSS functions;
4.1.2 BBS Activities: types of units to be created in BBS, number of BBS workstations and workstation function; BBS Initialization; BBS Files: TOE.PRN, INIT.PRN files to be provided by [responsible party], per schedule, inputs required; tables of BBS units per BBS workstation; BBS archive usage; Deleting Units in BBS: circumstances, station(s), responsibility, procedure references; Actions to Reduce Disaggregation: circumstances, sequence of commands, responsibility
4.1.3 Manned Simulators: type, number, location, role, anticipated range within the scenario; interactions with other simulators/simulations
4.1.4 Entities to be Included: Task organization and major equipment, weapon systems
4.1.5 Level of Resolution
4.1.6 Terrain
4.1.7 Situation to be Demonstrated
4.1.8 Tactics to be Demonstrated
4.1.9 Blue ModSAF
4.1.10 Observer/Controller Workstation
4.2 AAR/Replay Requirements
4.3 System Baseline Identification

4.3.1 Software: references document containing baseline description and/or development requirements
4.3.2 Hardware: references document containing baseline description and/or development requirements
4.4 Personnel: staffing requirements and staffing source
4.5 Facilities
4.5.1 Physical Requirement: power, space
4.5.2 Work Station Requirements: tables, chairs, partitions, telephones, special equipment (camouflage netting)
4.6 Communications
4.6.1 Administrative Communications
4.6.2 Tactical Communications
4.6.3 Data Communications
4.7 Administrative Support
4.7.1 On-Site Support: office space, photocopying, and facsimile support
4.7.2 Off-Site Support: local acquisition sources

5.0 IMPLEMENTATION
5.1 Schedule
5.2 Equipment Reception
5.2.1 Receiving: location, point of contact
5.2.2 Property Accountability
5.2.3 Intra-Site Movement
5.2.4 Storage
5.3 Installation5.4 Display Area Preparation
5.5 Training
5.6 Testing: contractor activities at OSF and site(s); personnel required and schedules
5.7 Rehearsals: Government activities at site(s); personnel required and schedules
5.8 Demonstrations: Government activities at site(s); personnel required and schedules; visitor activities: number, type, schedule, support required
5.10 Data Collection: data logger (AAR), data to be collected and method of collection

6.0 DEMONSTRATION CLOSE-OUT
6.1 Disassembly
6.2 Packing
6.3 Shipping
6.3.1 Staging Area
6.3.2 Intra-Site Shipment
6.3.3 Inter-Site Shipment
6.4 Stay Behind Equipment
6.5 Property Accountability

APPENDIX A - ACRONYMS

APPENDIX B - POINTS OF CONTACT

Sample Exercise Timeline Table, days noted in days prior to Exercise (E-day)

E-180	Initial Planning Conference	Identify key participants and locations. Coordinate and Identify target dates for simulation center usage and communication links. Define initial scenario. Formulate broad data collection requirements. Establish a draft temporary duty assignment (TDA) list. Distribute draft site survey forms. Determine terrain play box
E-160	Site Surveys	Determine existing equipment, power and HVAC capabilities at the sites. Identify equipment shortfalls. Determine telephone system capabilities.
	Schedule Long Haul Comm	Determine long haul communication requirements and request DSI support
E-150	Publish Road to War	Publish initial draft of STARTEX conditions and simulated force activities that led to STARTEX conditions
	Publish Collection Plan	Publish draft collection plan. Identify data to be collected & collection source
	Publish Comm Plan	Publish draft Comm plan.
E-120	Mid Planning Conference	Review Data Collection plan, Temporary Duty Assignments (TDA) and system architecture. Consolidate Master Event Scenario List (MESL) inputs. Identify SIMNET models to be represented in DED file.
E-110	Finalize Comm Reqts	Order additional phone and data circuits
	Analyze system capabilities	Begin analysis of troop list and scenario to determine entity requirements.
	Finalize support personnel requirements	Organize Observer Controller Group, White Force Cells, OPFOR and Admin. Request external support if needed
E-90	Data Base Construction	Insure BLUE and OPFOR Databases are being constructed. Insure SIMNET/DIS DED and Mapping files are built. Assign Bumper numbers to align SIMNET and Constructive simulations
E-70	Publish Simulation Control Plan & Technical Control Plans	Determine database and system constraints. Determine System start, stop, pause and restart procedures. Publish telephone/Comm address listings. Determine daily exercise/AAR schedule.
E-60	Final Planning Conference	Review Scenario, MESLs and system constraints.
E-45	Tech Training	Train Remote Site Technicians on new equipment.
E-30	Database Completion	Finalize Unit Databases
E-10	Simulation Training	Begin player training on simulation systems (BBS, ModSAF, SIMNET)
	OC/Analyst Training	Train OCs and Data Analysts on equipment (Logger/AAR system)
E-7	Mini-Ex	Conduct Mini-Exercise to Verify training
E-6	Exercise Brief	Brief Training Audience on STARTEX Conditions, Simulation Constraints and problem/Lessons Learned Reporting procedures
E-2	Finalize dB maintenance	Perform final dB validity check.
E-1	Establish STARTEX positions	Place units and archive STARTEX positions for all players. Final Mapping of Bumper numbers.

Appendix K

Sample Requirements